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Cognitive control of perceived exertion

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COGNITIVE CONTROL OF PERCEIVED EXERTION

by

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ABSTRACT

Individual psychoeducational strategies were developed for 13 female endurance athletes in an attempt to alter their perceived exertion. Subjects' rate of perceived exertion (RPE) and heart rate (HR) were measured every 2 min. for a total of 6 min. while they exercised on a treadmill at 80% predicted maximal HR, pre- and posttreatment. Maximal oxygen uptake ($\dot{V}O_2$max.) was measured pre- and posttreatment so that any changes in perceptions of exertion could be attributed to the psychoeducational strategies and not to physiological improvements. Athletes practiced the treatment for 21 days. Data concerning imagery ability, vividness and controllability, and initial subject orientation toward discomfort that arises from endurance activities were collected using various inventories and questionnaires. Individual treatment acceptance was a major influence in treatment effectiveness. Results indicated that treatment was effective, exhibited by decreases in pre- and posttreatment RPE. Eleven subjects perceived decreases in the rate of exertion at posttreatment.

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Requirements for the Degree
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CERTIFICATE OF APPROVAL

MASTER OF SCIENCE DEGREE

This is to certify that the Master of Science Thesis of

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submitted in partial fulfillment of the requirements for the degree of Master of Science in the School of Health, Physical Education, and Recreation at Ithaca College has been approved.

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DEDICATION

I mae fy nhad, fam, a theulu,

i gyd yn annwyl i mi.

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Chapter 1

INTRODUCTION

Performance for an athlete is the culmination of weeks, months, and possibly years or a lifetime of hard physical skill practice. Yet all too often the movement patterns that are so well learned and almost automatic disintegrate under pressure for no apparent physical reason. An effective solution to this problem may lie in careful evaluation of individual cognitions before, during, and after the learning and performance situations (Meichenbaum, 1975).

Answers do not readily exist for individuals from group research, therefore investigations must be conducted on an individual basis. When dealing with individual performances, group analysis may not be the best method for obtaining specific answers.

Human behavior is characterised by belief of what individuals feel to be true about themselves (Maltz, 1960). Individuals gain this knowledge from experience and others' reactions to them. Therefore, if performance is ineffective it may be due to inferior beliefs and feelings about their abilities. An obvious solution would be to alter those beliefs so that they are oriented toward successful experiences and desirable outcomes (Nideffer, 1976).

In order to achieve this change, heightened awareness and sensitivity to one's cognitive processes

and thoughts have to be achieved in conjunction with knowledge of how they influence human performance. Alertness to these feelings directs attention inward to physiological processes and psychological responses. This allows self-statements and images of oneself to be modified through reasonable and rational reorganisation. The self-statements and images then have implicit meaning and relevance to the individual and the situation. The individual can understand the conditions better and this may lead to a more distinctive solution.

Belief in personal control over situations is often derived from previous successful experience. Failure experiences convey the opposite beliefs (Kleinke, 1978) but these can be restructured to provide useful information and learning. Belief that coping is possible will enhance one's ability to cope. Inner images and inner talk will become vivid and directly oriented toward a successful outcome. The more vivid the inner experiences the more real the resultant behavior will be.

The human nervous system cannot distinguish the imagined from the real; it responds to both conditions similarly (Maltz, 1960). Psychoeducational techniques capitalize on this inadequacy. They can help to convert negative thoughts that lead to negative behavior into positive ones. Negativity can be recognised and replaced with positive oriented thoughts and images. Vivid and well structured inner talk and images will deceive the

nervous system into responding in successful patterns. These successful patterns will become manifest in physical behavior, and so behavior will reflect the images that are perceived as reality (Suinn, 1972).

The optimal condition for achieving vivid, well-controlled inner experiences is one of relaxed attention where muscular tension is absent and mental alertness is increased (McKim, 1972). This can be achieved by practice until relaxation becomes the automatic response to tension producing situations. Behavioral experiences will then be consistent with the inner thoughts.

This study attempted to provide these conditions for endurance athletes using taped psychoeducational strategies. Relaxation procedures, previous success experiences, and imagery in multi-sensory modes were recorded on cassette tape for the subjects to listen to for 21 days. They practiced control of their thoughts and imaging processes through these strategies during regular endurance workouts. Subjective estimations of effort were tested to evaluate any change in perception which indicated increased control over physiological responses of fatigue and discomfort. An attempt to control for improved physiological condition that may affect perception was made by assessing maximal oxygen uptake, prior to and after the implementation of the treatment program.

Scope of Problem

Personalised psychoeducational strategies were developed and applied in an attempt to alter female endurance athletes' subjective rate of exertion. Subjects were 13 female Ithaca College track team members who participated in this study voluntarily. Their daily workouts with the track team involved endurance workloads for 2 hr.

Subjects completed four treadmill testings in which they were required to subjectively rate workload intensities. Subject reliability was determined from these scores. Subjects exercised on the treadmill at 80% of their predicted maximal heart rate (HR) (220 minus age) the rate of perceived exertion (RPE) was recorded pre- and posttreatment.

Subjects completed the Betts Questionnaire of Mental Imagery (QMI) and the Gordon Test of Visual Imagery Control (TVIC) to determine their abilities on these two variables. Subjects also completed the California Q-set, which required the sorting of 100 personality descriptors into characteristics most and least like themselves. The resultant self-profiles were then correlated against the prototype of an augmenter and a reducer type athlete (of pain and discomfort), evaluated by three experienced endurance event coaches.

Subjects were interviewed as a group and were then asked to complete a feedback sheet to ascertain any

existing personal coping strategies for discomfort during endurance performance. From this information, personalised strategies for coping with discomfort during endurance practice and performance were developed and recorded on cassette tape. This was the treatment, which subjects practiced for 21 days by listening to the cassette tape each evening and applying the techniques during regular track practice.

Following the treatment, subjects' perceptions of physical exertion were once again measured at the same workload (80% predicted max. HR). Subjects' $\dot{V}O_2$max. were measured pre- and posttreatment to assess any changes in fitness levels across the 21 days of treatment. Subjects then completed a post-season questionnaire which requested detailed evaluations of participation in the study.

Statement of Problem

The effects of psychoeducational strategies on the subjective rate of exertion were examined.

Hypothesis

Psychoeducational strategies will reduce the perception of physical exertion and fatigue.

Assumptions

The following assumptions were established for this study:

1. Perceived exertion will not be enhanced by familiarity with the rating scale.

2. Treadmill running in the laboratory was an appropriate measurement criterion for running.

3. The psychological variables measured by the inventories were relevant to the subjects' orientation toward treatment acceptance.

4. All subjects were truthful in their estimations, feelings, and thoughts in answers to the inventories.

Definition of Terms

The following terms have been defined for the purpose of this study:

1. Perceived exertion is the subjective rating of physical exertion and degree of fatigue of workloads. It utilises all sensory feedback and interpretations of bodily states.

2. Maximal oxygen uptake ($\dot{V}O_2max.$) is an individual's capacity to use oxygen during physical exercise recorded in milliliters per kilogram of body weight per minute (ml/kg/min.). The greater the amount of oxygen utilised the more efficient the individual system. $\dot{V}O_2max.$ has been shown to correlate with physical fitness levels. $\dot{V}O_2max.$ is measured by gas analysers which collect expired gases while the athlete exercises on a treadmill at given speeds and workloads.

3. Relaxed attention is the reduction of body and mental tension and associated physiological symptoms.

The body and mind do not attend to any irrelevant stimuli but are focused on intentions.

4. Controllability of imagery is the ability to direct and maintain images along a pre-set path of achievement.

5. Vividness of imagery is the ability to conceive specific mental images with particular clarity and definition.

6. Psychoeducational strategies are personal coping techniques used by the athletes to cope with discomforts that arise naturally from physical endurance workouts.

7. Reducer type athletes have the capacity to fight through fatigue and pain when training or competing. Little aches and pains do not seem to be much of a problem. They appear to be personally in charge of their performance.

8. Augmenter type athletes have a difficult time with fatigue and pain when training or competing. Little aches and pains seem to be "blown out of proportion." They appear to lose control of performance to fatigue and pain.

Delimitations

The following delimitations were appropriate for this study:

1. Thirteen female endurance-event track athletes were utilised as subjects.

2. The Betts QMI scale was the only test administered to assess the degree of vividness of mental images.

3. The Gordon Test of Visual Imagery Control was the only test administered to assess the ability to control mental images.

4. The California Q-set was the only test used to assess athlete resemblance to the prototype of an endurance athlete; one who can cope with the physical discomfort of endurance events.

5. Treatment comprised selected psychoeducational strategies of relaxation, a standard-success experience, and individualised coping techniques.

6. Treatment extended across a period of just 21 days.

Limitations

The following limitations existed for this study:

1. The limited practice time for treatment may not be adequate for all subjects. Therefore, the effectiveness may be reduced and different results occur with extended treatment periods.

2. Different results may occur with other psychoeducational strategies.

3. It is difficult to attribute whether the success or failure of the treatment was due to the relaxation technique, standard success experience, or personalised strategy.

4. These results only pertain to this group of female endurance athletes, due to individual variables of treatment acceptance.

5. Treatment effectiveness relied on individual acceptance of cognitive restructuring, which necessitated subject committment and belief in the treatment.

6. The results of this investigation only apply to exercise up to 6 min. duration.

Chapter 2

REVIEW OF RELATED LITERATURE

The examination of related literature in this chapter will consider the influences affecting psychoeducational strategies, perceived exertion, and selected physiological responses to exercise. The review will be structured under the following headings: (a) perceived exertion, (b) techniques for behavioral management, (c) the role of imagery in behavioral management, and (d) the effects of exercise on HR and oxygen consumption.

Perceived Exertion

The concept of perceived exertion was originated by Borg at the Institute of Applied Psychology, University of Stockholm in Sweden. Perceived exertion deals with the subjective estimate of the exertional costs of work effort (Borg & Noble, 1974). This subjectivity has a direct effect on the decision to continue or cease hard physical work and also governs the choice of work intensity.

Using the Borg protocol, the exercising individual is requested to assign a numeral to represent the subjective sensations of the amount of work being performed. Morgan (1973) suggested that perceived exertion depends not on "what the individual is doing but rather on what he thinks he is doing" (p. 97).

Interest in the psychological aspects of physical work or power has grown rapidly since Borg developed the

Rate of Perceived Exertion (RPE) scale. Studies have been conducted to determine whether environmental conditions and individual differences affect perceived exertion. Investigations which will be cited later include factors such as heat, drugs, hypnotic suggestion, expectancy and their influences on perceived exertion.

Borg emphasised that human efficiency of performance can be measured accurately physiologically, but psychological measures are influenced by many varied factors. The key to understanding humans at work encompasses not only physical responses but questions what effort the individual has to expend. At what costs? How is the task perceived? How hard or difficult is the task for the subject?

The subjective symptoms associated with physical work intensity are manifested in perceptual data and can be viewed as a second class of stress indicators, the primary class being the exact or objective assessment of measuring of physiological responses which are derived from stress testing (Borg & Noble, 1974).

Work on perceived exertion has primarily been conducted in order to attempt to improve human efficiency in performance. For example, the work capacity in rehabilitation for coronary patients was measured using the RPE scale. The scale has also diagnostic value in medicine and exercise prescription. The intensity of work or treatment can be regulated by the subjects' perception of fatigue,

exertion, pain, discomfort, or satisfaction. Subjects or patients can be exercised at their appropriate level, and goals can be regulated for maximum efficiency without risk of physiological damage.

Scales for Perceived Exertion

Borg developed the RPE scale as a simple and direct measurement of the degree of exertion and fatigue. It is widely used and, in most experiments, ratings of perceived exertion increase linearly with heart rate (HR) (Borg & Noble, 1974). The RPE scale is a 15-point scale ranging from 6 to 20. Category 6 has a verbal anchor of very, very light exertion and category 20 has a verbal anchor of very, very hard exertion. These number ratings approximate 1/10th of HR/min. for individuals of 20 years of age. It is also possible to predict HR from the following equation: HR = RPE x 10.

The reliability and validity of Borg's RPE scale has frequently been examined. Skinner, Hutsler, Bergsteinova, and Buskirk (1973) tested the RPE scale and found that randomly assigned workloads correlated as highly with HR as did progressively increasing workloads. Subjects were able to perceive equally well differences in work intensity under both conditions. They concluded that the progressive test was of sufficient reliability and validity and offered the advantage of taking less time.

Borg initially worked with a rating scale that comprised 21 points ranging from very, very light exertion to very, very hard exertion. Ratings correlated highly with HR (r = .85) for healthy people. However, linearity was found to increase by reducing the scale to the 15-point graded category scale described earlier. Other scales were also developed and utilised, namely: (a) a line scale where subjects marked the intensity of their perception on a line scale. To the left of this line was written "maximal exertion," and to the right was written "no exertion at all," (b) a 9-point graded scale designed by Noble, Robertson, and McBurney (Borg, 1973) where category 2 corresponded with "not at all stressful" and category 8 with "very, very stressful," and (c) yet another scale developed by Borg (1973) where subjects estimated their degree of exertion in relation to the notion of maximal exertion designated as 100. Results using this latter scale revealed low correlations with HR of r = .31 for bicycle ergometer work at 600 kpm/min. and r = .56 for 900/kpm/min. (Borg, 1973). Due to the low reliabilities, this scale has not been used extensively.

Original work with perceived exertion was conducted on dynamic muscular exertion (Borg & Linderholm, 1967). Subjects worked on a bicycle ergometer for short durations (i.e., less than 1 min.) but reliable results were achieved when compared to results over a longer period of time.

However, data were considered spurious by some investigators as workloads were administered in non-random order. Consequently, Borg replicated the study administering workloads in varying intensities and in random order; results were the same as reported earlier.

The relationship between RPE and HR has never been suggested as causal, although high intercorrelations do exist. Borg and Noble (1974) point out that this is not surprising since the scale was developed with such a relationship in mind.

Physiological Factors of Perceived Exertion

Perceived exertion has a complex nature and its sources may be derived from various body locations. Both central and local factors have been suggested as the originators of perceived exertion (Ekblom & Goldbarg, 1971). The central factors comprise HR and oxygen consumption ($\dot{V}O_2$), where stress is placed on pulmonary ventilation and circulation systems. The local factor has its source in the working muscles.

Controlled changes in HR by administering drugs and increasing environmental heat did not elevate or decrease RPE in healthy young subjects (Ekblom & Goldbarg, 1971). This seems to indicate that perceived exertion is not always a direct correlate of central measures (i.e., HR). Pandolf, Cafarelli, Noble, and Metz (1972) demonstrated the local factor at work. The pedalling rate on a bicycle ergometer

was lowered for subjects and the resistance was increased. Subjects then worked at high pedalling rate and low resistance levels. Perceived exertion was elevated when resistance was increased, indicating that perceived exertion is not always a function of metabolic equivalence but of local muscular stress.

A study from the Human Energy Research Laboratory, University of Pittsburgh, by Noble, Metz, Pandolf, Bell, Cafarelli, and Sime (1973) produced results that indicated that HR is not always an exact mirror image of RPE. They examined walking and running at similar HR levels. During running, perceived exertion was always lower than while walking (e.g., at HR 150 bpm RPE was 10.3 for the running condition, and 12.1 for the walking condition). It was concluded that the physical discomfort of walking at 5.5 mph or at a HR of 150 bpm was responsible for the incremented rates.

Local factors have also been compared across limbs. At the same $\dot{V}O_2$ levels arm exercises produce higher lactate levels than leg exercises (Astrand, 1960). Ekblom and Goldbarg (1971) suggested that the lactate accumulation is the most important factor in perceived exertion. The elevated RPE's for arm exercises compared to leg exercises at the same absolute workload supports this assertion.

Considering the evidence in support of central and local factors as the catalytic sites for perceived exertion,

it appears that local factors have the major contribution. The perception seems to concern somatic sensations from the joint capsules and ligaments (Pandolf et al., 1972) culminating in tension on the muscles and tendons.

Psychological Factors of Perceived Exertion

Physiological factors do not totally account for RPE ratings (Morgan, 1973), therefore other factors must impinge upon the value estimations of subjects' "effort sense." Psychological studies may yield pertinent information and answers.

Morgan, Raven, Drinkwater, and Horvath (1973) found that hypnotic suggestion can affect RPE. Hypnotically-induced subjects' RPE values closely adhered to the experimenters' suggestions of different workloads, even though the workload remained constant at 600 kpm/min. on the bicycle ergometer. Even HR changed to correspond with the experimenter's suggestions. Expectancy of exercise intensity and duration also affects RPE (Rejeski & Ribisl, 1980). RPE values were decreased when subjects ran for 20 min. when they were led to believe that they would be running for 30 min. HR ventilatory volumes and respiratory rates were similar in the 20-min. run and the supposed 30 min.-run. Subjects were found to delay the unpleasant consequences of fatigue until the task was virtually complete, suggesting they may have employed some kind of coping technique to suppress these consequences.

Morgan (1973) suggested that a combination of physiological and psychological influences are the source of RPE. The physical response relies on the processing of perceptual information (e.g., perceived exertion). Bartley (1970) associated perceived exertion with the perception of pain through the homeostatic and "comfort" systems. He suggested these are two additional perceptual systems which are closely dependent on physiological mechanisms for their information. The homeostatic system comprises various internal receptors responsible for body regulation. Such receptors are found in blood vessel walls. The "comfort" system has been identified as a mechanism of awareness for experiential bodily comfort which involves the sensing of pain, temperature, and touch. Changes in the body states during physical stress can upset these systems and play an important role in the perception of exertion.

In summary, perceived exertion concerns the subjective estimate of how hard individuals think they are working. What is actually being perceived and subjectively rated is still relatively unknown, since so many physiological responses increase linearly with increasing workload. An individual's subjective estimate of effort is generally governed to a large extent by actual workload. Irrespective of the scale being used, healthy young subjects can perceive differences in workload intensities (Borg & Noble, 1974).

This has been demonstrated for progressively increasing workloads and randomly selected workloads (Skinner et al., 1973).

The factors responsible for an individual's RPE are not well understood and a substantial amount of contradictory evidence concerning the physiological locations of "effort sense" exists. Some investigators have proposed that HR is a primary cue (Borg, 1973), others have suggested that ventilatory minute volume is a key stimulus (Morgan, Hurota, Wietz, & Balke, 1976). Still others maintain it is the accumulation of metabolites and waste products in the working m scles (Morgan & Pollock, 1976).

Psychological and physical changes in the environmental and individual conditions affecting the central and local factors can cause changes in RPE without affecting HR. Similarly the converse is true where changes in HR do not affect RPE.

Perhaps Ekblom and Goldbarg's two-factor theory is reasonable for explaining perception of exertion. The first is the local factor involving muscle stress, and the second is the central factor involving perception of ventilation and circulatory stress, not the actual physiological processes, per se, but the externalisation of these processes (Noble et al., 1973).

Borg combined all factors, local and central, to explain perceived exertion. He viewed perceived exertion as a "gestalt" of all bodily feedback comprising sensations

from the organs of circulation and respiration, from the muscles, the joints, and the skin. A combination of all bodily sensations from various locations contribute to perceived exertion.

As it stands, RPE can be a useful additional tool in work capacity testing for medical and athletic purposes. Patients can indicate appropriate levels for rehabilitation using the RPE scale. They can monitor their own bodily sensations and adjust exercise intensity accordingly to match their perception of effort. RPE has been shown to be subject to manipulation through physical and psychological devices. It may, therefore, be of use in medical circles to safely extend peoples' capacities beyond their normal stopping point.

Behavioral Management Techniques

Many situations arise in life and sport where individuals believe the conditions of the environment will exceed the limits they can endure. Sometimes this may be a true evaluation of the situation, but often this may be a false appraisal. Events that are perceived as potentially in excess of one's limits will arouse anxiety and will provoke the individual to seek escape from the situation. Perceptions are of great importance to behavioral and cognitive control and may change the meaning of a situation from one that is a threat to one that is within the normal limits (Kleinke, 1978).

The importance of perception is demonstrated by Simonton (1978, cited in Lazarus, 1979), a physician who trains cancer patients to perceive themselves in control of the healing of their diseases. His teaching is based on strong beliefs, positive attitudes, and expectations towards healing. A change in attitudes and beliefs can alter perception, and through this individuals can be shown that they can control their responses to aversive stimuli. Control may be achieved through two types of strategy, associative and dissociative.

Associative strategies focus attention on the task. Individuals can regulate their physiological responses through cognitive control (Meichenbaum, 1975). They learn to recognise the potentially aversive stimuli and use them as cues to initiate a self-control strategy. Individuals may reassess or reframe the situation (e.g., physiological responses attributed to anxiety may be relabelled as arousal or interest (Lazarus, 1976).

Dissociative strategies are used to divert the individual's thoughts away from the task that is causing anxiety and inhibition. Some dissociative techniques involve counting backwards and imaging relaxing scenes. Extreme measures are offered by Lazarus (1979) who recommended avoiding aversive stimuli by denial of reality. The efficacy of these strategies, however, will depend specifically on the individual and the parameters of the situation.

Often the demands of the task may be totally incompatible with an individual's skill level and response repertoire, but many instances arise where individuals merely believe they are not capable of responding appropriately. The performance outcome may be attributed to other competitors' performance or environmental factors. Individuals and athletes who do not believe in their ability to exert some control over the outcome need help to reassert their personal control.

Personal control over performance can be achieved by replacing negative images and failure-oriented self-directions with success-oriented ones. This restructuring is necessary as the brain processes all images and then instructs the body to respond according to this information (Maltz, 1960). Individuals need to persuade themselves that successful performance is possible. They must also be aware they have certain strategies available to them to increase this possibility.

In high standard athletics, physical skills are so closely matched among performers that the psychological conditioning is critical to performance (Zaremski, 1980). Therefore, at world class level, athletes who are success-oriented in their thoughts and who genuinely believe in their ability will tend to be the optimum performers (Suinn, 1980). Less competent athletes may experience failure more consistently than top class athletes because

their thoughts and beliefs may be centered on past mistakes and errors. The brain receives this negative information and directs the body to respond accordingly. Further failure is imminent unless a restructuring of the negative attributions occurs. Self-control toward successful performance can only exist by recognition of behavioral deficits and application of strategies to produce the desired behavior.

Self-control is a process where individuals guide, choose, and regulate their own behavior toward a desired outcome. It is a learned process through social contacts and experience. A repertoire of effective responses is acquired as the individual experiences more complex situations. These responses need judgment and direction for their purposes and are exercises in discrimination and problem solving (Goldfried & Merbaum, 1973). The need for self-control usually only appears when normal response chains are not sufficient to cope with the situation. Usually there is a choice between an immediate and rewarding situation and aversive consequences (Kanfer & Goldfoot, 1966). The choice may be dictated by social pressures but ideally the decision should be made free of any social agents, if it is to be deemed true self-control (Goldfried & Merbaum, 1973).

Self-control can be learned and, according to London (1959), it is necessary to defend individual freedom. More

and more frequently we are concerned with the dangers of external control (e.g., where environmental factors delay finishing a task). Following is a review of some of the more popular modes of behavioral management through self-control.

Relaxation

Relaxation is a key element throughout all the techniques that will be dealt with. McKim (1972) emphasised the importance of relaxation, and Benson (1976) concluded that many of the self-control techniques themselves are merely elaborate methods of inducing relaxation.

Relaxation techniques involve decreasing muscle tension while at the same time increasing mental alertness. Nideffer (1976) suggested that this is possible as the individual's attention is diverted from bodily sensations and is free to concentrate on the task at hand. The relaxation process usually requires concentration on the specific techniques and not on actually relaxing. If individuals force themselves to relax and relaxation is not achieved, frustration results, making it even more difficult to relax. Nideffer (1976) asserts that it is important to recognise that distractions do occur and to use the distractions as a cue to concentrate on the technique that induces relaxation.

Physical and mental relaxation allow individuals to direct attention to the desired goal without distraction.

Achieving this state of muscular relaxation and mental alertness requires a great deal of practice. It is essentially a skill and its aim is to become the automatic response to any tension-producing stimulus (Maltz, 1960). Recommendations for optimal learning vary but a minimum of three to four deep relaxation sessions per week, each of 40 min. duration, is necessary to attain any adeptness in tension-producing situations (Budzynski, 1978). The goal is to develop the relaxation response into a well-learned and habitual one.

Of the several relaxation techniques, some involve concentration on muscular relaxation and some on mental relaxation. Still others involve verbalisation and visualisation of imagery. Jacobson's (1938) progressive relaxation is a technique specifically designed for muscular relaxation. Jacobson recognised that individuals had to be able to discriminate between tension and relaxation before they could produce an appropriate relaxing response. In progressive relaxation individuals are instructed to tense and release various muscle groups in sequence so that they become aware of these conditions. Once they are aware of how tension feels they can recognise it in their own bodies and subsequently begin relaxation exercises. Orlick (1980) has found that athletes and dancers are particularly aware of bodily muscle tension and find these techniques easy to use and progress very quickly.

Zaremski (1980) introduced a similar technique of relaxation involving first tensing and then relaxing, and associated these with breathing exercises. She also employed a centering technique where athletes were required to let themselves become quiet with each breath. Zaremski also used imagery in which the athletes were asked to visualise a portion of their sport but to make no judgments about it. They were merely to be in the action and still observe the performance. This allowed the athletes to be involved without the consequences of real-life sport situations.

Some techniques involve mental strategy for relaxation. Benson (1976) asks the subject to sit comfortably and repeat the word "one" for approximately 20 min. This word has no particular connotations and can be likened to the Sanskrit syllable or mantra used in Eastern philosophies and practices (Layman, 1978). The mind's attention is directed to the word and is not centered on negative thoughts or irrelevant information. Benson has used the relaxation response frequently in clinical procedures and has recorded reductions in the physiological measurements of blood pressure and lactic acid accumulation (which contributes to muscular fatigue). The relaxation response is similar in nature to the Eastern practices of transcendental meditation (TM), yoga, and zen where a "calming of the mind" is practiced. These practices are consistent with Maltz' (1960) premise that the body is preprogrammed to react appropriately but must be sufficiently relaxed to do so.

Autogenic Training

Autogenic training involves verbalisation and visualisation as part of relaxation. Schultz and Luthe (1959) developed this procedure emphasising respiratory control and thermal regulation in conjunction with suggestive phrases, such as heavy, warm, long, calm, and stretch to achieve the desired outcome of a relaxed state. Autogenic training has proven particularly effective for swimmers and sprinters (Wenz & Strong, 1980) who progressed through tension, relaxation, and competitive readiness by repeating the phrases silently and/or visually.

Biofeedback

Biofeedback for behavioral control has more frequently been used in clinical settings and less in sport. Biofeedback is an external verification method of the extent of biological activity (e.g., electromyography (EMG) or body temperature (thermal)). Individual's are initially connected to sensitive instruments which record physiological responses and transmit same immediately. Individuals learn to recognise tension and initiate the natural, learned response, relaxation. The internal body feedback becomes the focus of the individual's attention and, therefore, distracting stimuli are not attended to. Individuals can learn whether or not to respond to certain stimuli and to control responses.

Systematic Desensitisation

Systematic desensitisation is imagery-based and was originally used by Wolpe (1969) to overcome anxiety problems in a clinical setting. Since that time it has often been used for alleviating phobias (Kazdin, 1975). Desensitisation attempts to alter the valence of noxious stimuli by repeatedly pairing them with responses that are favorable or reinforcing. Wolpe (1969) used this method with athletes and began the sessions with relaxation techniques. This was followed by scenes that were considered distressing to the athletes. The scenes were intensified progressively until they became extremely vivid. Gradually the distressing situation was approached in reality while the athlete still maintained a relaxed condition. Wolpe claimed effectiveness on the premise that relaxation and inhibition cannot exist at the same time. Suinn (1976) demonstrated systematic desensitisation in action with the 1976 United States (U.S.) Ski Team at Innsbruck. A skier who had recently lost confidence in his ability to race was directed physically and in imagery through his race. The courses he "skied" progressed in difficulty as he successfully completed each run.

Thought Stopping

Thought stopping is yet another technique favored by Suinn (1976). Individuals are taught to recognise negative

thoughts and use them as cues to stop and immediately replace them with positive thoughts. One skier from the U.S. Nordic Team skied to a strong driving beat of a favorite tune. Whenever a negative thought crossed his mind he immediately recalled the melody and refocused his attention on skiing to the beat.

Visuo-Motor Behavior Rehearsal (VMBR)

Suinn has developed a technique known as visuo-motor behavior rehearsal (VMBR) which essentially involves three stages: relaxation, practice of imagery pertaining to the skill at hand, and the use of imagery for strengthening psychological responses and motor skills. Suinn's procedures include a brief version of Jacobson's progressive relaxation practice until relaxation becomes the automatic response to the stressful situation. Mental imagery is initially directed by the coach, and then athletes are gradually encouraged to image on their own. Athletes must feel "in" the situation and not merely be thinking of the situation. Therefore, if the coach initiates questions for vividness then they must concern appropriate and explicit experiences for that athlete.

VMBR may be used to attain optimum levels of arousal necessary for maximum performance. Under-aroused athletes may become motivated by rehearsing their event, and over-aroused athletes may become calmer. Suinn recognised four benefits from VMBR: (a) relaxation and anxiety reduction

in transfer from practice to performance, (b) concentration improvement, (c) error correction, and (d) skill development. With each imaginary rerun, athletes become more and more familiar and confident with their skills. VMBR is aimed at increasing habit strength under specific stimulus conditions. It is concerned with the enhancement of performance and not solving emotional problems (Titley, 1980).

Attention Control Training (ACT)

Nideffer and Sharpe (1979) developed a technique for behavioral control which dealt with the control of attention. The method is called Attention Control Training (ACT) and is specifically aimed at training mental awareness and concentration. ACT concerns the ability to voluntarily direct attention, and to concentrate in ways consistent with the demands placed upon the individual by the task (Nideffer & Sharpe, 1979). ACT requires a passive concentration similar to relaxed attention where the individual should be aware of the total environment before decisions to react are made. Nideffer and Sharpe (1979) relate ACT to athletics in the association between mental and muscular tension. Muscular tension increases the likelihood of performance inhibition and breakdown and this effect may occur due to mental tension.

These techniques are concerned with altering the behavioral response by relabelling or reframing the stimulus

that elicits a particular response. The stimulus is the cue to alter behavior. If new responses can be associated with old stimuli, then they will eventually decay and break old habits (Guthrie, 1935). Thus, cues to behavior would have to be carefully identified and personal control could become more effective.

Rational Emotive Therapy (RET)

This technique was developed by Ellis (1962) and is based on the same idea as ACT. The primary objective of RET is to teach individuals to perceive environmental cues more clearly or in a different framework. Individuals can come to see that a response arises from emotional reaction to what is believed to be there and not the actual situation. If the situation caused the response, then everyone would respond in the same way. But, it is evident that there are individual differences in responses to most all situations. Reevaluation of the situation is possible through imagery rehearsal and role-playing, creating a hierarchy of increasingly difficult situations. The individual learns to cope in stages, and coping becomes the natural behavior.

"In vivo" Emotive Therapy

"In vivo" emotive therapy, developed by Horan (1973) is similar to RET. Horan used "in vivo" emotive therapy for pain control in childbirth. The imagery involved

individuals attending to meaningful thoughts and emotions and events concerning easy childbirth. The techniques were not merely distractive but directly associated with the cause of pain and how to overcome it.

Other associative techniques are often used by athletes who encounter pain and discomfort in the exhaustive levels of their training and performance. Morgan and Pollock (1976) examined world class marathon runners (all having completed in 2:20 or less). The runners reported they paid close attention to their bodily sensations and thought specifically of running and the race. However, they did constantly remind themselves to "relax" and "stay loose." Merely relaxing may have been the technique enabling them to overcome the discomfort. Many even denied the existence of the proverbial "wall." Morgan and Pollock suggested that this situation arose from the athletes' superior running ability and their ability to monitor their own bodies, so that they could adjust their effort and intensity and not over-tax themselves too early. They, therefore, did not subject their bodies to overt pain and stress.

There are many more techniques developed for behavioral control. Some are specific to particular sports (e.g., brain power golf (BPG) developed by Wenz and Strong in 1980). BPG involved using relaxation techniques, imagery, and review of good shots. Some techniques were developed for every day, real-life situations but are applicable

to sport too. Most methods are concerned with changing a response by reevaluating the stimulus strength. Adverse physiological reactions serve as the cue to begin the strategy and individuals are taught to recognise these cues. Practice is imperative so that the change in behavior becomes the automatic response. Most methods demand a relaxed state, combining a decrease in muscular tension, and increase in mental alertness. This state is termed relaxed attention and is the most receptive state for the effects of imagery. The imagery involved in these techniques is a body-thinking process where the body is allowed to respond to the images conceived.

Conscious thought of performance can serve as a rehearsal for actual performance. The imagery involved often causes muscular responses. EMG traces of a U.S. skier who practiced his race only in imagery were examined, and they were found to correspond with the timing of particularly difficult sections of the course (Suinn, 1976). In one way imagery can be more effective than actual practice, although would not be advised alone for enhancing performance. Imagery allows practice to take place in perfect comditions whereas normal practice takes place in less than perfect conditions, and naturally errors are made. Perfection can only be accomplished by perfect practice (Fisher, 1982).

These techniques are designed to help overcome immediate aversive conditions and to achieve delayed rewards. They give control back to individuals and allow them to

direct their own behavior. All the techniques are not suitable for all people, but an appropriate one can be found for most individuals through trial-and-error. Once selected, practice is important along with belief and expectations of success. These techniques only increase the probability of performing well-learned skills rather than improving actual skills (Titley, 1980). Therefore, they serve as a very useful and necessary supplement to performance.

An evident characteristic of these techniques, and others like them, is the presence of imagery. The role of imagery is pertinent to the effectiveness of these techniques and will be discussed in the next section.

The Role of Imagery in Behavioral Change

Perceived and Conceived Images

Individuals' perceptions about the world and their role in the world will directly affect their behavior. Perceptions are subject to many influences and a particular situation may be interpreted in many ways by different individuals. The original perceived image may become distorted by feelings, beliefs, and attitudes, which then characterise human behavior. The conceived image may not always represent the truth. However, the normal operating processes of the human brain and nervous system is contingent upon the conceived image. The human nervous system cannot readily distinguish between what is real and what

is imagined (Maltz, 1960) and, therefore, confusion may arise between the outer world of percepts and the inner world of images (Richardson, 1969).

The brain reacts to the image that it "believes is the truth, the reality, rather than the things images represent" (Maltz, 1960, p. 34). An illustration to support the assertion that it is difficult to distinguish reality from thoughts and ideas of reality (e.g., adrenaline is secreted as the fight-or-flight hormone response to real exciting or fearsome situations but it is also secreted in those situations believed to be exciting or fearsome).

The conceived image is conjured up in the absence of current external stimuli, and lies between the stimulus and the percept. Imagery is not restricted to any sensory modality, but encompasses visual, auditory, tactile, gustatory, olfactory, cutaneous, organic, and kinesthetic modes. However, imagery is most vivid in the visual and auditory modes. The effects of imagery are not exclusive to any group of people but are well within the range of normal, healthy, psychologically balanced individuals (Perky, 1910; Segal & Nathan, 1964).

Richardson (1969) has suggested that imagery is more predominant in younger people due to the fact that older people are not so impressionable and easily swayed by their sensory responses. Total lack of imagery is a rare

occurrence (Cohen, 1955), but its existence may be masked by the societal emphasis in schematic and linguistic behavior. The education system of Western countries is based on these concepts and, therefore, children are indirectly being taught how not to respond and recognise their imagery as potentially useful devices for learning.

Visualisation and Verbalisation

Of all the modes of imagery the most predominant in individuals are visual and verbal imagery. Most people can utilise both forms but some rely almost exclusively on one or the other (Richardson, 1969). Griffitts (1924) organised imagery into a hierarchy of vividness and from a group of 87 subjects found that 90% had images of greatest clarity in the visual mode and 5% in the auditory mode. He also discovered that whenever the auditory mode ranked first the visual mode was a close second, as was also apparent when the kinesthetic mode ranked first. McKellar (1957) found that the majority (70%) of a random unselected population alternated between visualising and verbalising and that 15% were habitual verbalisers and 15% habitual visualisers. It appears that the majority of people can use visual or auditory modes or both for imagery. Therefore, maximum efficiency in the use of imagery for behavioral change can be achieved by limiting imagery practice to these two modes. Differences will be apparent between habitual verbalisers and habitual visualisers

(Richardson, 1969). Visualisers' imagery tends to be more idiosyncratic than verbalisers' imagery. Richardson suggested this is due to the fact that verbalisers use words in the form of inner speech in their imagery. Words and their meanings are created and validated in society "while images and their meanings are personal creations and are never validated in this way". (Richardson, 1969, p. 85).

Whether individuals relate information to themselves through visual or verbal imagery, the effect on the central nervous system will be the same. The brain receives the same information and reacts accordingly to the reality and truth it conceives.

Vividness and Controllability

Image effectiveness is dictated by the stability, intensity, duration, and clarity of the image. Its quantity and quality may be more or less intense. If perceived or conceived images are not clear enough, then the nervous system will not be deceived into believing the image as reality. The intensity of the image will not always be less than the original sensations on which they are based. It is important not to confuse vivid imagery with accurate perceptual memory (Sheehan, 1966). Visual imagery often involves a "body thinking" process where the nervous system responds to the sensations. Individuals feel they are being projected backward or forward into the situation; perceptual memory is merely recall and thinking of the situation.

Imagery vividness can be tested using the Betts QMI Vividness of Imagery Scale (Richardson, 1969), which is a revised 35-item test of the original Betts test constructed in 1909. High scores indicate poor vividness of images and low scores indicate good imaging abilities.

The more vivid the image, the more real it is believed to be. Therefore, mental practice of vivid imagery could become the symbolic rehearsal for a physical activity. Richardson (1969) suggested that improved performance could result from this form of practice. Clark (1960) demonstrated the effects of imagery as a rehearsal technique with a group of basketball players. Clark taught one group to practice foul shots every day for 20 days. Another group had no practice between pre- and posttreatment, while a third group were instructed to picture themselves performing the shots perfectly every day for 20 days. Improvements in foul shots after 20 days were as follows: practice group--24%, no-practice group--0%, and imagery group--24%. Physical practice had the same percentage improvement as mental practice in this investigation. Maltz (1960) cited the example of Vandell who showed that mental practice in throwing darts at a target improved aim as much as actual practice of the skill. Orlick (1980) also provided evidence of the powerful effects of imagery in his example of a female archer who, during her practice sessions, mentally simulated the conditions that she would encounter in real-life

competition. However effective mental imagery can be for performance, alone it is not sufficient. But when combined with physical practice, it can facilitate performance (Orlick, 1980; Suinn, 1976). Clark's results do not support this statement but even his subjects were not totally naive to the skill of dart throwing and they had had actual experience of the skill.

Mental imagery can also be used to help overcome problems. An athlete can learn to cope with the problem before encountering it in reality. The athlete, therefore, has at least been through the situation and may have acquired some outlook on the solution. However, actual performance may not follow the scenes of the mental preparation but, providing the individual has the physical capacity to complete the task and sufficient learning, there is some evidence to indicate that performance will be enhanced (Orlick, 1980; Suinn, 1972).

The importance of vividness of imagery is relative to controllability. Gordon (1949) indicated that positive imagery might be useful in behavioral control by reconstructing and simulating a situation, but that extremely vivid imagery would be likely to disrupt effective problem solving. Gordon also emphasised that too much dependence upon imagery may reduce the quality of performance. Therefore, control over imagery is essential. Gordon (1949) also stated that vivid imagery without control can have a

detrimental effect on performance. A subject used mental imagery in preparation for basketball shooting but "could only image the ball being stuck to the floor when he bounced it." This disturbed him so much and affected his performance that he could not even imagine himself shooting successfully.

The Gordon Test of Visual Imagery Control (Richardson, 1969) is used to assess subjects' ability to control images. Individuals are asked to answer "Yes," "No," or "Unsure" to 12 test scenes. If all these test scenes are answered in the affirmative then the individual is categorised as controlled. If one or more test scenes are answered in the negative then the individual is categorised as autonomous or uncontrolled. Illustrating the effect of controllability and vividness and their combinations is an investigation by Start and Richardson (1964). Subjects were divided into groups according to their scores on the Betts QMI and the Gordon TVIC: vivid-controlled, weak-controlled, weak-uncontrolled, and vivid-uncontrolled. The subjects were beginner gymnasts and were required to image themselves performing a swinging technique. After 6 days of mental practice comprising 5 min. per day, the subjects performed the swings and were scored by experienced judges. The mean score was taken for each group and the results were as follows: vivid-controlled, 57.10; weak-controlled, 51.88; weak-uncontrolled, 47.89; and vivid-

uncontrolled, 47.89. These results indicated that the optimum condition for performance improvement was vivid-controlled and the least desired was vivid-uncontrolled. According to this study, controllability of images may be the deciding factor in determining the effectiveness of images.

Conditions for Imagery

Imagery does not necessarily need to be spontaneous or indeed original, providing it has meaningful connotations for the individual imager. Images can be prepared in advance and attention may be guided away from irrelevant and distracting stimuli and redirected toward specific and appropriate stimuli. Clinically this is termed psychosynthesis (Kosslyn, 1980) and has been termed "the guided daydream" (Richardson, 1969).

The individual efficiency at employing images has been described as a human capacity and not an ability (Cohen, 1955). Training may be necessary before detailed or controlled images are evoked. Alpha-rhythm control has been suggested as one training method for inducing the necessary state for vivid-controlled images (Kamiya, 1968). The suggestion that imagery can be trained for is negated by Griffitts (1924) who demonstrated visualising efficiency was subject to heredity and genetic endowment. Visual imagery of identical twins was more alike than that of fraternal twins. If genetic representation is a contributory factor then, there are obvious limitations on

learning of imagery skills and their performance effects. There is little support however for the genetic endowment assertion, as vividness and controllability can be increased through practice and application (Gordon, 1949; Richardson, 1969; Suinn, 1972).

Vividness and controllability can be altered by practice and familiarity with internal experiences (Richardson, 1969). Gordon suggested that weak imagery is derived from lack of familiarity with the internal stimulus environment. Many people are in fact only unaware of their imagery and have learned to ignore it. Imagery may only appear to be distractive and, therefore, its true value may not be apparent.

Imagery may be affected by belief and expectations of success or failure (Fromm, 1952). Langer, Janis, and Wolfer (1975) demonstrated subjects' expectations of discomfort in a task and then decreased their tolerance and threshold of the discomfort. The investigators suggested that the subjects' attention was directed toward the onset of pain and, therefore, they were very susceptible to the first signs of it. If their attention had been diverted, Langer et al. indicated that subjects' threshold and tolerance of discomfort would be increased. However, Meichenbaum (1975) suggested that if subjects' attention is directed toward the discomfort, threshold would decrease but tolerance would increase as subjects could find ways of dealing with the discomfort.

Uses of Imagery

Imagery has been applied for behavioral control and change, and among its successes are: overcoming problems such as fear and stress (Orlick, 1980; Suinn, 1976), motivating and increasing arousal in preparation for performance (Fromm, 1952), and rehearsing routines and races when physical practice is not possible due to injury (Suinn, 1972). Imagery has also been a dissociative technique to aid in the coping of discomfort (Morgan & Pollock, 1976). Morgan and Pollock examined the cognitive processes of elite marathon runners during competition. Morgan's early work revealed that there is a general trend by runners to dissociate (i.e., direct their thoughts away from the actual experience of running). Morgan reported on one runner who age regressed himself and recalled as much as possible about his educational experiences from first grade to his doctoral work. The experience was always unique in that each time he remembered something different. Yet another runner "listened" to a stack of Beethoven records. The runners suggested that these techniques "help them negotiate various pain zones and particularly the proverbial (or mythical) 'wall'" (Morgan & Pollock, 1976, p. 92).

A similar form of dissociation has been used by Tibetan monks, Mahetangs, who are trained in the art of lung gom (swiftness of foot). They are reported to run

300 miles in 30 hr. over rough terrain, in cold weather. One particular runner repeated to himself a sacred chant or "mantra." His respiration was kept in rhythm with the phrase as he ran. The runner fixed his eyes on a distant object and did not look from side to side (Watson, 1973). Morgan and Pollock (1976) replicated these reports using a pseudo-mantra, on the word "down." Young adult males were asked to walk to exhaustion at 80% $\dot{V}O_2$max. Performance was enhanced an average of 30% above the baseline measurement. Morgan concluded that the improved performance was due to the subjects' willingness to endure or cope with the discomfort or pain of continued effort and was not due to cardiovascular, metabolic, or endocrine limitations.

Morgan (1976) found also that there were other types of strategy used by elite athletes; these were categorised as associative. The athletes monitored their bodily sensations regularly and used this information to regulate their effort intensity.

Conditions for Imagery

The most conducive condition for imagery is one of inactivity (Fischer, 1969). Fischer claimed no conceived images are possible while the individual is actively responding to the environment. He argued that only perceived images are possible. Other investigations indicate that imagery is in fact possible during activity. It also appears to reduce sensitivity

to discomfort (Segal, 1971). Images are reported to interfere with signal detection of discomfort. Perhaps imagery, therefore, would be a useful tool for individuals working at endurance workloads, where discomfort becomes a major factor in performance. Presumably this reduced sensitivity is due to a change in perception (Girodo & Wood, 1979). Perception of pain and discomfort will obviously affect the individual's ability to endure it. Petrie (1967) examined individual differences in the modulation of sensory experience (i.e., discomfort from an intense degree to a very subdued degree). She noted that there were three types of reaction to pain: reduction, mediation and augmentation. Reducers do not readily perceive pain; augmenters increase the effect of pain; and moderators are fairly realistic in their perception. These characteristics would affect an individuals choice in enduring discomfort such as that naturally arising from long distance running.

Individuals within these categories do not necessarily remain in them, there are responses that can be learned for pain control. Horan (1973) developed his "in vivo" emotive imagery which aided pain control for childbirth. It involved individuals attending to meaningful thoughts and emotions concerning easy childbirth. The strategy was effective in increasing pain tolerance whereas purely distractive imagery has been shown to reduce pain tolerance (Horan & Dellinger, 1974)

In summary, imagery is a private and exclusive experience and can deliver the individual from dependence on the immediate experience to projections into the future and the past. Its functions are manifest in the recreating of successful and unsuccessful experiences where much can be learned from taking a second look, or a last minute rehearsal, or creating situations which may occur. Imagery can transform confusion into meaningful information and prepare the individual for the future by focusing on problems and possible solutions (Neisser, 1967).

Imagery does not appear to be uniform across all sensory modes, but McKellar (1957) suggested that a general imaging ability exists. He found that visual and auditory modes were more predominant. The cumulative effect of imagery is difficult to determine as there is no foolproof way of knowing and assessing the validity of the images that the subject reports in any investigation (Marks, 1977).

Images can have a positive or a negative effect and should be vivid and controlled for their maximum efficiency (Gordon, 1949). The images must be intense so that the nervous system momentarily mistakes them for reality. Imagery is a skill that can be improved and developed alongside physical skills. However, imagery alone does not improve physical performance (Neisser, 1967). However, imagery allows the simulation and ultimately the decision of what is possible and what is not possible. Vivid and

uncontrolled imagery is hazardous as there may be no truth in the images but their clarity may deceive the imager.

Clarity and liveliness depend on the subjects' adeptness in translating images into verbal communication. Thought and speech place limitations on the individual's inner world (Gordon, 1949), and it seems that when "man invents, construes, and constructs ways and means in the form of images for his orientation in this world, he is dependent on his communicative skills to make sense of his imaging" (Gab, 1949, cited in Richardson, 1969, p.72).

Training may be necessary to become aware of imagery, by paying attention to the inner channels of stimulation. Orlick (1980) suggests mental imagery is a first step in attempting to overcome problems or anticipated problems, with the next step being to "practice the coping strategy in a real world situation, in a simulated competitive situation and finally in the competitive situation itself" (p. 99). Only in real-life pressure situations can the real effectiveness of imagery in behavioral control be assessed. When working with imagery it is essential to be ambitious but still maintain a realistic outlook. Orlick reminds us that despite the reality of imagery it does not endow any special capacity. Its purpose may be in taking an individual's mind off any thoughts of self-control (i.e., "give a last second feeling of confidence that frees the body to perform (Orlick, 1980, p.90).

Vivid and/or controlled imagery may provoke physiological responses which assist the athletic performance. The next section reviews the physiological and psychological factors affecting bodily responses of HR and oxygen consumption ($\dot{V}O_2$).

Effects of Exercise on Heart Rate and Oxygen Consumption

Heart rate (HR) response is a commonly used indicator of the magnitude of exertion (Ellestad, 1981; Lamb, 1978; Shephard, 1972). It increases linearly with intensity of exercise and oxygen consumption. It is a necessary and useful criterion for the setting of exercise programs and training schedules for rehabilitation and training of patients and athletes, respectively.

Resting HR varies from less than 30 beats per min. (bpm) in highly trained athletes to as much as 100 bpm in sedentary middle-aged and overweight people. HR is generally higher in females and is increased by exercise, smoking, and eating. HR is very sensitive to changes in the physiological and psychological environment and elevates or decreases rapidly in accordance to these changes (Ellestad, 1981).

HR response can be lowered by regular exercise. At a standard work load the unconditioned heart may beat at least 40 times more per min. as the conditioned one (Glagov, 1979). The heart that is conditioned is, therefore, more efficient. The optimum conditions for attaining the

the best pulse response from exercising varies from one individual to the next across frequency, intensity, duration, and mode of exercise (Ellestad, 1981).

At rest the heart pumps 5 to 6 l/min. of blood into arteries of healthy college age people. This is termed cardiac output (CO). During exercise this may be increased to 22 to 30 l/min. The higher volumes generally occur in trained athletes during maximal endurance work. Increased CO that accompanies exercise is due to increased HR and stroke volume (amount of blood pumped from the right atrium to the body) (Rowell, 1969).

When exercise begins HR increases almost instantaneously. Tachycardia (elevated HR) is apparent on the first beat after the onset of exercise (Lamb, 1978). The response is so fast that it is generally agreed to be a nerve reflex, perhaps originating from receptors in the working muscles and joints (Petro, Hollandee, & Bouman, 1976). These impulses continue and pass into the spinal cord and the cardiac regulating center of the brain. The vagus nerve is inhibited and HR can increase. Increased HR during exercise may be explained by the secretion of adrenaline or noradrenaline, hormones which stimulate heart response. Another contributing factor is the vasoconstriction that occurs from non-working muscles. Blood is redirected to the organs that need it most. The right atrium fills quicker and blood is pumped faster around the body.

This is known as the Bainbridge Reflex and is caused by pressure on sensitive receptors in the walls of the right atrium (Shephard, 1972). HR may also be increased by the accumulation of lactic acid in the muscles through exercise. Potassium is also lost from the muscle cell and this causes an increase in the arterial blood pH which sends nerve impulses to the medulla. Here at the medulla vagal output is inhibited and sympathetic output increased and so tachycardia results.

There is also a mechanism within the heart which may cause elevated HR during exercise (Lamb, 1978). Increased amounts of blood filling the atrium stretches its walls and causes a firing of the sinuatrial node regulating HR response. The internal temperature of the heart increases during exercise and this leads to an increase in electrochemical impulses that stimulate the heart to beat.

After exercise HR decreases as the impulses from the muscle spindles and joint receptors also reduce. HR does not decrease rapidly, and this may be due to a lingering effect of the adrenaline and noradrenaline and increased temperature of the heart. The lactic acid, potassium, and carbon dioxide (CO_2) affect the cardio-regulation center of the brain and HR may remain fairly constant at an elevated level until these chemicals are dissipated.

Oxygen Consumption

During exercise the muscles of the body work harder

and faster than under normal conditions. They, therefore, need more oxygen (O_2) to function than when at rest.

For exercise that lasts over 3 to 4 min. the principal limiting factor is the heart, lungs, and circulatory system's ability to deliver O_2 to the working muscles and to carry chemical waste products away. The ability of a trained person to run and swim farther and faster is, according to many physiologists, entirely explained by the improved functioning of the trained heart. Other functional changes are of little significance (Ellestad, 1981).

The degree to which the circulatory and respiratory systems limit performance depends on the intensity and duration of the activity. Long distance running is of relatively low intensity and the activity consists mainly of rhythmic, non-static muscle contractions, and the exercise is generally aerobic in nature. Running 400 to 800 m can be limited by the oxygen transport activity which is the anaerobic energy producing system in many large muscle groups. Shorter events involve an even larger anaerobic components (Lamb, 1978).

The oxygen consumption of the total body during maximal response to exertion is found to correlate well with the degree of conditioning and is accepted as an index of total body fitness (Taylor, Buskirk, & Henschel, 1955). The capacity to take in oxygen is related to lung efficiency,

and the ability of the heart and circulation to transport oxygen to the body and to metabolise it.

When exercise begins the demand for oxygen exceeds intake. If work is relatively mild this oxygen deficit is paid off quickly and oxygen consumption is adjusted to suit the exercise intensity until a balance is reached; this is called the steady state. To attain this equilibrium, an exercise duration of 2 to 3 min. is required for well conditioned athletes. As maximal exertion is approached, a steady state becomes more and more impossible. As metabolic waste products build up and lactic acid accumulates at muscles, more oxygen is needed than can be delivered. After exercise, oxygen is still delivered at a higher level until the deficit is repaid (Ellestad, 1981).

Testing Aerobic Efficiency

Evaluating cardio-respiratory fitness involves testing the maximal functional capacity of the heart, lungs, and circulation which essentially is the body's capacity to consume oxygen at a maximal level (Nagle, 1973). Therefore, a test of maximal oxygen uptake ($\dot{V}O_2$max.) has been stated as the most accurate single measure of aerobic capacity and physiological fitness. A high score in $\dot{V}O_2$ max. however, does not automatically mean an outstanding performer (Nagle, 1973) even though $\dot{V}O_2$max. is a good indicant of aerobic capacity. Many other factors play an important role, such as individual motivation toward the

task, pain and discomfort tolerance, and orientation toward success.

$\dot{V}O_2$max. is the maximum volume of oxygen consumed in liters or milliliters, and the dot over the V is a notation that indicates that this unit is expressed in units of time (usually per min.). $\dot{V}O_2$max. is usually expressed corrected for body weight in kilograms. The oxygen is used by all the body tissues, therefore, larger bodies will use more oxygen than smaller bodies. For comparative purposes, it is normal to record oxygen consumption corrected for body weight (Ellestad, 1981).

$\dot{V}O_2$max. represents the greatest difference between the rate at which inspired oxygen enters the lungs and the rate expired oxygen leaves the lungs. Therefore, inspired and expired air must be measured. The difference is the amount of oxygen taken up and used in producing energy for active tissues. Resting oxygen consumption may be increased 10 or 20 times during exercise. $\dot{V}O_2$max. for the average college female is between 30 and 40 ml/kg/min. The intake of oxygen increases almost linearly with HR and CO.

$\dot{V}O_2$max. may be influenced by the method used to measure it. Although the heart and cardiovascular capacity are the major determinants of $\dot{V}O_2$max. the capacity of working muscles is also critical. Oxygen demands of the working muscles depends on muscle mass and metabolic efficiency,

therefore, a larger mass of muscle leads to a potential higher absolute oxygen uptake (Astrand & Rodahl, 1970). Running produces a higher oxygen uptake. Treadmill running has been pronounced as the method of measuring most accurately values of $\dot{V}O_2max$. Treadmill tests are considered the best as they are subject to least differences in skill and efficiency between subjects (Nagle, 1973). Also the speed and gradient can be adjusted for all subjects, so that those who are not physically capable of running can still be evaluated by walking at different gradients (Taylor et al., 1955). The Bruce protocol for treadmill testing suggests maintaining the same speed and increasing the gradient. The treadmill does not induce intense muscular fatigue before a maximal oxygen consumption level is reached as other modes of testing (e.g., bicycle or step-test). Prior to testing $\dot{V}O_2max$. prediction of HR is essential. HR measures are used as they increase linearly with $\dot{V}O_2max$. and will indicate approximately the level to cease the test.

Exercise intensity and duration must be great enough to elicit a near-maximal response (Ellestad, 1981). A minimum of 3 to 4 min. is usually necessary for a running activity and at least 20 min. for walking. The exercise intensity may be progressively increased until maximal performance is reached or the subject expresses a wish to stop the test. Maximal performance is recognised by

oxygen consumption reaching a plateau or perhaps a slight decline. If this level is not reached, it may be difficult to assess if the exerciser did in fact reach maximal capacity. When maximal levels of human functioning are approached stringent safety measures are taken. Prior to testing estimations of the individual's medical history is advisable. A physician or exercise physiologist must always be present in case an emergency occurs. However the risks of injury are minimal especially in young healthy adults. When sub-maximal target HR is used as a criterion for cessation of the test, it is essential the exerciser as well as the sensitive recording equipment is carefully monitored, in order to minimise risk. Under these conditions the $\dot{V}O_2$max. test is safe. $\dot{V}O_2$max. testing has advantages in predicting those most fit for athletic endurance performance and also for medical purposes. It helps in the detection of cardiovascular disease and in assessment of individual capacity for exercise prescription.

In summary, HR and oxygen consumption are the most important limiting factors in exercise. Fitness training can improve the heart's response to exercise and allow the athlete to perform under more intense conditions for a longer duration. The elevated HR that is apparent during exercise can also be caused by psychological factors, as well as physiological ones. The response is essentially the same and occurs via similar hormonal

and chemical changes. Emotions elicit responses that elevate HR and $\dot{V}O_2$, but unlike exercise these responses do not get dissipated, instead they remain within the body and may eventually cause many kinds of physiological problems.

Measurement of maximal oxygen consumption ($\dot{V}O_2$max.) is an accurate indicant of physical fitness but does not presume to pinpoint future champions, although it is true to say that most endurance event athletic champions do have a high $\dot{V}O_2$max. Many other factors influence champion performance. Motivation and pain tolerance for athletes are most important if the athletes are to become sufficiently trained to reach high levels of performance. The physiological responses (HR and $\dot{V}O_2$) are of paramount importance but also athletes need skill and the indefinable "talent" to become champions.

Testing $\dot{V}O_2$max. in recent years has become a very efficient and safe procedure. It can be used for primary selection for athletic endurance events, and in the medical world for diagnostic purposes and exercise rehabilitation programs.

HR and Psychological Factors

HR can be elevated even when no exercise takes place. Psychological stress can cause chemical and hormonal changes within the body, which have somewhat similar effects as exercise. Emotions, such as fear or excitement

result in physiological reactions such as elevated HR and increased respiration (Cox, 1978). The heart is stimulated by the release of adrenaline from the adrenal medullary center which mobilises the body's resources for immediate action. Thus, catecholamine secretions bring about rapid change in cardiovascular function which permits immediate action. This "emergency reaction" results in an increased rate and volume of blood pumped to the muscles and brain. A deepening of respiration also occurs similar to that during exercise. Blood is pumped around the body more rapidly and is directed to the most essential structures. More energy producing substances are readily available to the blood and its oxygen carrying capacity is increased. Many real-life situations promote these responses to the cardiovascular system and, when individuals are unable to become mobilised to dissipate these responses as they are originally intended to, problems occur. Coronary heart disease is the most frequent and dangerous condition arising in life today (Cox, 1978). The key to understanding and eliminating human adverse psychological response to stress lies in the coping response. This response is centered on invididual well-being and is the individual's ability to maintain performance when exposed to extreme conditions (Lazarus, 1976).

Chapter 3

METHODS AND PROCEDURES

The following chapter considers all the methods and procedures involved in this investigation of perceived exertion: selection of subjects, subject reliability, testing instruments, testing procedures, methods of data collection, construction of treatment, administration of treatment, treatment of data, and summary.

Selection of Subjects

Subjects were 13 female Ithaca College students who participated in this study voluntarily. Each subject signed an informed consent form detailing procedures and purposes of this study (Appendix A). Subjects were members of Ithaca College track team and practiced daily for 2 hr. at various endurance workloads.

Subject Reliability

Subject reliability at perceiving differences in effort intensity at three different workloads on a treadmill was determined. Subjects ran for 2-min. intervals at 3, 4.5, and 6 mph, for a total of 6 min. Subject's HR and RPE were recorded after each 2-min. interval. This procedure was administered twice on Day 1 and twice on Day 3. The 12 RPE for each subject were then subjected to Pearson product-moment correlation to obtain a reliability coefficient.

Testing Instruments

Subjects exercised at a constant workload, 8 mph, until their HR reached 80% of predicted maximal HR, calculated individually (220 minus age). At regular intervals RPE and HR were recorded. RPE was recorded from the subjects' estimations of effort intensity according to the Borg Rate of Perceived Exertion scale. This is a a scale which has been shown to correlate with HR (r = .85) (Borg & Noble, 1974). The scale ranges from 6-20 and has corresponding verbal anchors of very, very light to very, very hard exertion (Appendix B). HR was measured indirectly by palpating the pressure pulse obtained from the carotid artery.

$\dot{V}O_2$max. was obtained on a treadmill set at progressively increasing workloads and gradients, until maximal aerobic capacity was reached. $\dot{V}O_2$max. is the single most accurate and efficient method of measuring the functional capacity of the oxygen transport system (Ekblom & Goldbarg, 1971).

The Betts QMI scale (Richardson, 1969) is a revised 35-item test of the original Betts test constructed in 1909. The aim of this test is to ascertain total vividness of imagery. Seven modalities are involved: visual, auditory, olfactory, cutaneous, kinesthetic, gustatory, and organic. The degree of vividness of each mode is rated on a scale of 1-7 and corresponds with verbal anchors of "perfectly clear and as vivid as the actual experience" to

"no image at all, you only know that you are thinking of the object."

The Gordon Test of Visual Imagery Control (TVIC) (Richardson, 1969) is a test to determine subjects' ability to control or manipulate visual images. "Yes," "No," or "Unsure" responses are required to 12 test scenes. If all test scenes are readily visualised, subjects are considered controlled. If one or more are answered with "No," subjects are categorised as autonomous.

The California Q-set is designed so that any personality characteristic can be assessed. The test demands the sorting of 100 personality descriptors in depiction of oneself into nine categories ranging from most characteristic to least characteristic. These self-assessments are then matched to prototypes. The prototypes in this study were those of augmenter and reducer type athletes whose approach and acceptance of discomfort during endurance activities were the main concern. The prototype templates were compiled from the California Q-set and were the evaluations of three experienced endurance event coaches.

Feedback inventories requiring personal information regarding orientation toward cognitive restructuring and treatment acceptance were completed (Appendix C and D).

Subjects exercised at a rate of 8 mph on a treadmill at 80% predicted maximal HR. RPE was then recorded at 2-min. intervals for 6 min. from the Borg RPE scale, which was constantly visible to the subjects. HR was also recorded at each 2-min. interval manually from the carotid artery. Subjects completed this test prior to treatment and again after 21 days of treatment practice. Measurement of RPE served as the dependent variable for this investigation.

$\dot{V}O_2$max. was tested prior to treatment and again after 21 days of treatment practice. $\dot{V}O_2$max. measures the functional capacity of the cardio-vascular-pulmonary systems (Ekblom & Goldbarg, 1971). These systems are directly responsible for fitness levels. Therefore, pre- and posttreatment measures were necessary in order to attribute any changes in RPE to the psychoeducational techniques and not to changes in physical condition and efficiency.

Methods of Data Collection

The duration of this investigation was 28 days, inclusive of testing and treatment sessions. All subjects completed the tests and treatment in the following order:

Day 1: Reliability of perception of physical exertion (RPE); Betts QMI Vividness of Imagery scale; Gordon Test of Visual Imagery Control.

Day 2: Group meeting with the investigator to discuss the importance of imagery, cognitive restructuring, and personal control over performance; also to ascertain any existing coping strategies and complete feedback information sheets (Appendix C and D).

Day 3: Repeat RPE reliability.

Day 4: Pretreatment $\dot{V}O_2max$.

Day 5: RPE at 80% predicted maximal HR at 8 mph on the treadmill. First night listening to the cassette tape of individualised cognitive strategies.

Day 5-25: Treatment practice, listening to tape, and utilising during regular workouts.

Day 8, 12, 20: Telephone or personal contact to discuss treatment problems.

Day 14: California Q-set.

Day 26: RPE measurement at 80% predicted maximal HR.

Day 27: Posttreatment $\dot{V}O_2max$.

Day 28: Post-season questionnaire to assess treatment acceptance and involvement in the study.

Construction of Treatment

Initially all subjects met with the investigator to discuss the importance of the psychological aspects of endurance running. It was widely speculated by the subjects that at least 60% of performance relied on psychological factors. Among these factors was the willingness to endure discomfort. Each subject recalled at some time

enduring discomfort during performance in order to achieve success. Subjects also recalled instances of giving into the discomfort by choosing to terminate participation. Subjects discussed their reasons for making each of these choices and what they said to themselves to promote or terminate performance.

Recognition and reaction to the discomfort was realised to be in the forms of inner talk and inner images, each of which held implications for continuing or discontinuing performance. Subjects recognised that sometimes they talked themselves out of a performance when physiologically they were capable. The destructive and constructive influences of inner experiences were indicated for performance.

Feedback sheets requiring personalised and detailed information of cognitive evaluations during performance were completed. Then the importance of restructuring cognitive processes, inner talk, and images in order to promote performance beyond discomfort and fatigue was discussed. From this information and feedback, detailed and personalised strategies were constructed (Appendix E) to help athletes through the discomfort of endurance work. These strategies were recorded onto cassette tape along with a brief relaxation exercise (Girdano & Everly, 1979) (Appendix F), a standard success experience (Appendix G), and musical selections from Neil Diamond's album "Jonathon Livingston Seagull."

Administration of Treatment

The information from the initial feedback sheet was assessed to create an individualised strategy for each athlete (Appendix E). These strategies were designed to help cope with the natural discomfort that arises from endurance workouts. The coping strategy comprised an initial brief relaxation exercise based on an abridged version of Girdano and Everly's (1979) relaxation exercise (reduced from 8 min. to 2 min.) (Appendix F). This was followed by a standard success experience where subjects were requested to recollect and imagine themselves in a past successful performance (Appendix G). The individualised strategies were devised from the images and inner talk already utilised by the athlete.

Each strategy along with musical selections from Neil Diamond's "Jonathon Livingston Seagull" album was then recorded onto cassette tape (approximately 18 min.). Subjects were instructed to listen to their tape just before going to sleep each night for 21 nights, and to practice the cognitive treatment daily in their regular track workouts. Each day of the study subjects evaluated their involvement with the treatment and its effectiveness. by completing a diary. Regular contacts were made with the subjects to discuss the treatment. Evaluations of treatment acceptance were made by reference to the post-season questionnaire, which asked for the athletes' opinions of the treatment.

Treatment of Data

Individual reliability of RPE were assessed at 12 treadmill workload trials prior to the administration of treatment. Workloads of 3, 4.5, and 6 mph were administered four times each in random order at two sessions. Subjects allotted an effort intensity number to each workload from the Borg RPE scale. RPE scores were subjected to Pearson product-moment correlation.

Analysis of covariance (ANCOVA) with repeated measures was used to test pre- and posttreatment RPE differences at 2-, 4-, and 6-min. intervals using $\dot{V}O_2$max. as the covariate. This covariate control was considered appropriate as $\dot{V}O_2$max. was an extraneous source of variation believed to affect the dependent variable (RPE). ANCOVA requires the relationship between the dependent variable and the extraneous variable to be linear, and also that measures of the extraneous variable not be affected by the treatment. RPE and $\dot{V}O_2$max. fulfill these conditions because they are known to exhibit a linear relationship (Borg & Noble, 1974). Also $\dot{V}O_2$max. is unlikely to be affected by any subjective variables because it is an absolute measurement of aerobic capacity.

Psychological data of individual abilities to image vividly and in a controlled manner, along with subjects' initial orientation toward discomfort as part of the endurance running experience were measured.

Imagery vividness scores revealed by the Betts test were subjectively rated and compared to each other. Scores had a possible range of 5-35 for each of seven modalities. The mean score for all modalities was found and this score placed the subject in a category of vividness. The categories for this investigation were very, very vivid imagery (6-10), moderately vivid (10-14), and fairly vivid (14-18).

Imagery controllability scores according to Gordon (1949) categorise subjects absolutely as controlled (12 "Yes" responses) or autonomous (1 or more "No responses). However, for this study the investigator chose to differentiate various degrees of controllability of imagery. Subjects who answered 10 or more scenes with "Yes" were considered controlled, 7-9 "Yes" responses were considered fairly controlled, and less than 7 "Yes" responses were considered autonomous. Imagery controllability could shed light on the dependent measure (RPE) only if it was cast in non-dichotomous terms.

Scores from the California Q-set were correlated against the prototype of a reducer type athlete and an augmenter type athlete using the Pearson product-moment correlation A correlation of .51 was needed for significance at the .05 level but the subjective estimations were made for all lesser coefficients. Subjects were typed by the investigator to be more like one prototype than another.

Summary

Thirteen female Ithaca College endurance athletes participated voluntarily in this investigation concerning perceived exertion. Subject reliability of effort perception was assessed.

RPE and HR were recorded at 2-, 4-, and 6-min. intervals to establish a baseline measure of the dependent variable. This was then restested posttreatment. Pre- and posttreatment RPE were tested for significance using ANCOVA keeping $\dot{V}O_2$max. constant. The Tukey multiple-comparison method was used to locate the significance between 2-min. intervals.

Individual existing coping strategies for dealing with fatigue and discomfort were evaluated from subjects' responses to the feedback sheet (Appendix D). Individualised strategies were developed and recorded on tape along with musical selections. Subjects practiced the taped treatment for 21 days.

Three psychological inventories were completed, namely: Betts QMI Vividness of Imagery scale, Gordon Test of Imagery Control, and the California Q-set. Posttreatment subjects completed an overall evaluation of their participation and acceptance of the treatment.

Chapter 4

ANALYSIS OF DATA

Personalised psychoeducational strategies were used in an attempt to alter the perception of exertion of female endurance athletes. RPE, HR, $\dot{V}O_2$max. data were collected pre- and posttreatment. Psychological data derived from the Betts QMI, the Gordon TVIC, and the California Q-set were utilised in the analysis of RPE.

All subjects completed all the tests and inventories except subject EE, who did not complete the posttreatment $\dot{V}O_2$max., and subject MeM, who did not complete the pretreatment RPE test at 6 min. and, therefore, no record was made for this trial at the posttreatment RPE test. Both subjects failed to complete due to illness, however their remaining data were still useful for analysis purposes. All data will be presented initially from a group perspective and then from an individual perspective.

Group Analysis

Reliability of RPE

Subjects' reliability of perceiving differences in workload intensities (RPE) were assessed at 12 treadmill workload trials prior to the administration of treatment. Workloads of 3, 4.5, and 6 mph were administered four times each in random order at two sessions. Reliability of RPE scores were subjected to

Pearson product-moment correlation. Reliability of RPE was considered excellent and ranged from $\underline{r}$ = .87 to $\underline{r}$ = .99

$\dot{V}O_2$max. Difference

$\dot{V}O_2$max. measures indicated that all the athletes were in good physical condition for endurance activities. College-age females generally reveal a $\dot{V}O_2$max. of between 30 and 40 ml/kg/min. (Astrand & Rodahl, 1970). while the mean value for a U.S. national women's team was 57.4 ml/kg/min. (DeCrosta, 1982). All the athletes in this study revealed $\dot{V}O_2$max. measures ranging from 46.9 ml/kg/min. to 61 ml/kg/min. (Table 1).

Significant difference existed between pretreatment and posttreatment $\dot{V}O_2$max., $\underline{F}$ (1, 9) = 22.59, $\underline{p} < .01$ (Table 2). The significant difference revealed an increase in $\dot{V}O_2$max. from pre- to posttreatment. Subjects increased their physiological fitness and aerobic capacity in the 28-day period of the investigation.

Seven subjects improved their $\dot{V}O_2$max. less than 3 ml/kg/min. and, therefore, their improvement was considered minimal for performance effects (Burke, cited in DeCrosta, 1982).

RPE Differences and Analysis of Covariance

RPE increased progressively at each 2-min interval for the majority of subjects. Estimations of effort intensity were increased with the duration of the exercise even though the workload remained constant.

Table 1

Pretest and Posttest Data for All Subjects

Subject	Pretest				Posttest			
		2 min.	4 min.	6 min.		2 min.	4 min.	6 min.
	$\dot{V}O_2max.$	RPE	RPE	RPE	$\dot{V}O_2max.$	RPE	RPE	RPE
DD	51.20	14	15	15	51.47	14	13	14
EE	51.30	16	17	16	-----	16	16	17
AG	48.38	15	15	17	55.16	15	15	17
MaM	54.87	16	17	--	61.90	16	14	--
MeM	47.01	12	14	14	55.90	13	15	17
JM	57 94	16	17	18	58.16	15	16	18
CM	60.21	14	15	16	61.85	13	15	15
MR	59.26	14	15	16	59.60	12	13	13
ES	55.86	16	17	18	57.24	15	16	17
MS	58.94	13	14	13	59.43	13	13	12
ST	58.10	17	17	19	61.61	16	17	16
PL	50.46	16	15	17	48.15	13	14	14
CV	48.90	18	18	18	53.65	18	19	17
M	54.21	15.0	15.6	16.5	56.57	14.3	15.1	15.5

Table 2

RPE Differences with $\dot{V}O_2max.$ Constant

Conditions	df	MS	F
$\dot{V}O_2max.$	1,9	13.37	22.59
Pre-post (P)	1,9	21.68	36.63*
Trials (T)	2,20	9.59	11.18*
P x T	2,20	.29	.74

* $p < .01$.

At posttreatment, overall RPE was reduced from pretreatment RPE but the increase between intervals was still apparent (Table 1). Athletes still exercised at 80% predicted maximal HR and at 8 mph but at posttreatment the effort intensity to perform at this level was perceived as decreased.

An analysis of covariance (ANCOVA) with repeated measures was used to assess whether there was any significant difference between pre- and posttreatment RPE over three trials with $\dot{V}O_2$max. held constant. ANCOVA indicated that a significant difference was present between pre- and posttreatment RPE with $\dot{V}O_2$max. as the covariate, F (1, 9) = 36.63, $p < .01$ (Table 2). The direction of the significant difference revealed that RPE was reduced at posttreatment. Subjects perceived less workload exertion at posttreatment even though the intensity was the same as at pretreatment.

The Tukey multiple-comparison method was used to locate the significant differences between RPE trials at 2, 4, and 6 min. A statistic of 3.07 was revealed which was not statistically significant between pairs of means. The significant F test indicated that some subset of means differed from other subsets of means (Hopkins & Glass, 1978). However, the difference between subsets of means could not be located by the Tukey method between trials. No interaction between pre- and posttreatment tests and trials

was evident (Table 2).

The mean scores for each 2-min. interval, pre- and posttreatment, make it possible to subjectively estimate the location of the most significant differences (Table 1). The greatest difference in RPE means occurs at the 6-min. interval. All the mean scores are decreased at each 2-min. interval from pre- to posttreatment (Table 1).

Heart Rate (HR)

HR data were not pertinent to the results of this investigation. HR measures were merely used as indicants of physiological stress the athletes were enduring. HR served as sufficient evidence for termination of the treadmill test if maximal levels had been reached.

Imagery Vividness

Subjects were all classified according to the Betts QMI Vividness of Imagery scale as moderately vivid to very, very vivid. On a scale of five to 35, five designating very, very vivid and 35 designating no images at all, subjects all scored less than 18 (Table 3). The most vivid images were conceived in the organic mode on the Betts QMI test. This category requests subjects to rate sensations in degrees of clarity and vividness on the rating scale. The sensations are fatigue, hunger, a sore throat, drowsiness, and "stuffed" from over eating. The next most favored mode of imaging was the cutaneous mode. Subjects were asked to rate the "feeling" of sand,

Table 3

Psychological Data for All Subjects

Subject	Augmenter r^a	Reducer r^a	Imagery Vividness	Imagery Controllability
DD	.17	.42	14.0	9
EE	.13	.35	16.6	3
AG	-.12	.51*	15.7	7
PL	-.03	.46	10.6	7
MaM	-.18	.58*	13.5	4
MeM	-.10	.53*	10.1	7
JM	.10	.29	15.5	7
CM	.13	.38	15.9	8
MR	-.05	.56*	12.7	10
ES	-.02	.44	15.4	9
MS	-.08	.04	6.8	11
ST	-.03	.56*	10.4	10
CV	-.17	.53*	10.4	10

* $p < .05$.

[a]Correlate of subject to prototype profile

linen, fur, a pin prick, and a warm bath. Visual and auditory modes were favored by only two subjects. All the subjects who possessed the capacity for vivid imagery, according to Betts, also had decreases in RPE. Subjects who were limited in their imaging ability did not appear to decrease their RPE as much as the previous group.

Imagery Controllability

Most subjects exhibited the ability to control and direct images as measured by the Gordon TVIC. Eleven subjects were considered controlled and answered "Yes" to at least seven of the 12 test scenes (Table 3). The relationship of RPE to imagery controllability does not appear to be very clear. Subjects who were considered controlled perceived limited or no change in effort intensity at posttreatment, while others who were not controlled did perceive changes in effort intensity.

Augmenter/Reducer

Subjects were typically more like the reducer prototype than the augmenter prototype (Table 3). Reducer types tend to perceive and accept discomfort as a part of the athletic experience. Discomfort does not easily force them to discontinue performance. Subjects were generally reducers, and this seems to be an important factor because 11 of the 13 subjects perceived decreases in exertion.

Individual Analysis

$\dot{V}O_2$max. Difference

An overall significant difference existed between pre- and posttreatment $\dot{V}O_2$max. scores. However, this was not uniformly distributed throughout all the subjects Seven subjects exhibited very limited change in $\dot{V}O_2$max. (i.e., less than 3 ml/kg/min.) (Table 1). This limited change should not affect perception or performance. Subject MeM had the greatest single increase in $\dot{V}O_2$max. with 8.89 ml/kg/min. change, while only one subject (PL) had a decreased $\dot{V}O_2$max.

Imagery Vividness

Imagery was very vivid for this particular group of subjects, although there was some variation within the group (Table 3). The highest score and, therefore, least vivid was EE with 16.6 and the most vivid was MS with a score of 6.8. Subjects PL, MeM, MR, ST, and CV were also particularly vivid, revealing scores of less than 13. The six remaining subjects (AG, MaM, JM, CM, DD and ES) were all classified as moderately vivid with scores between 13 and 17. Subjects who could image most vividly had the greatest decrease in RPE at posttreatment (except MS). Subject EE was least vivid and had no change in posttreatment RPE.

Imagery Controllability

Eleven subjects were considered fairly controlled and answered at least seven of the test scenes with "Yes." Three of these subjects (MR, MS, and CV) were considered extremely controlled and answered at least 10 secenes with "Yes." Two subjects (EE and MaM) were not considered at all controlled and answered only three and four test scenes respectively with "Yes." EE was also least vivid. The relationship of RPE to imagery was not well defined with regards to these subjects. Subjects MR, MS, and CV, although defined as autonomous, had varying degrees of decrease in RPE. There appeared to be no definite pattern to controllability and RPE level.

Augmenter/Reducer

Twelve subjects revealed personality profiles that were more clearly correlated with the reducer prototype than the augmenter prototype, five of whom correlated at least $r = .51$ ($p < .05$) with the reducer prototype, depicted by three experienced endurance coaches. Four subjects (EE, JM, CM, and MS) had low correlations with both the augmenter and reducer type ($r = .08$ to $r = .37$), but all except MS were closer to the reducer type. MS' correlation with the augmenter type and the reducer type were so low that is was impossible to categorise her into either of these prototypes.

Subjects personality profiles that correlated at least $r = .51$ with the reducer template all had some

decrease in posttreatment RPE, except subject MeM. Her perceptions increased at posttreatment. MaM was the most like the reducer type of all the athletes, with a correlation of $\underline{r}$ = .58. She also had a 3-point decrease in RPE at the 4-min. interval. Subjects who really did not qualify as either reducer or augmenter (i.e., exhibited low correlations on each prototype) had little decrease in RPE values at posttreatment.

Summary

Subjects participated in a 6-min. task on a treadmill and subjectively rated their level of exertion at 2-, 4-, and 6-min. intervals. Subject reliability at perceiving different workload intensities was assessed. All subjects were extremely reliable. Subjects then completed two tests which were designed to assess their imaging ability. Subjects also compiled a self-profile which was then correlated with prototypes of athletes who were reducers and augmenters of physical discomfort. Subjects' $\dot{V}O_2max.$ were measured pre- and posttreatment to determine any changes in physiological condition. Levels of exertion were then retested after 21 days of treatment practice at the same workload as the pretreatment test.

$\dot{V}O_2max.$ was measured prior to RPE trials and treatment and was repeated at the end of the treatment period. Subjects whose $\dot{V}O_2max.$ improved had only modest decrease in RPE at posttreatment. Subjects whose $\dot{V}O_2max.$ did

not improve had greater decreases in pre- to posttreatment RPE.

All subjects were vivid in their imaging ability. Their mean scores on the Betts test classified them as ranging between moderately vivid and very, very vivid. The more vivid imagers tended to perceive greater decreases in exertion at posttreatment.

The Gordon TVIC indicated that 11 subjects had good controllability of images. This condition did not seem as relevant to RPE as vividness of imagery.

Generally subjects were more like the reducer type than the augmenter type athlete, an important factor when considering RPE at posttreatment.

The most conducive abilities for reduction of perception of physical workload intensities were exhibited by subjects PL, ST, and MR. They had vivid and controlled imagery and were also reducers. The least conducive were low vividness, and low correlation with the reducer type. Most subjects exhibited at least one of these desirable and undesirable conditions.

Observations from data collected from RPE pre- and posttreatment revealed that the treatment effectively decreased subjects' perceptions of physical exertion between testing sessions. There was a significant decrease in RPE at the .05 level but the exact location of the significant decrease could not be located by the Tukey method, although it was possible to estimate where

greatest change took place by examining the means for each 2-min. interval pre- and posttreatment. The greatest decrease from pre- to posttreatment occurred at the 6-min. interval.

HR data, although recorded at pre- and posttreatment 2-, 4-, and 6-min. intervals, were not utilised for analysis purposes in this investigation. HR merely indicated the physiological condition of the exercising athlete.

Chapter 5

DISCUSSION OF RESULTS

This chapter discusses the results of this investigation with reference to both group and individual treatment effectiveness. Treatment effectiveness is indicated by differences in subjects' perceptions of physical exertion (RPE) from pre- to posttreatment, controlling for improvements in maximal aerobic capacity.

The discussion concerns the effect that improvements in aerobic capacity have on perception of physical exertion. Also discussed are the influences of particular psychological factors, measured prior to and during the treatment. These factors (imaging ability and augmenter/reducer profiles) are indications of subjects' ability to accept the treatment and maximise its effectiveness. The discussion also examines subject orientation and attitude toward cognitive restructuring as a behavioral control technique.

The hypothesis of this investigation, which stated that psychoeducational strategies will reduce the perception of physical exertion and fatigue was accepted. The treatment, individualised psychoeducational strategies, proved to be effective in reducing perception of exertion for 11 of the 13 subjects. The decrease in RPE posttreatment was significant at the .05 level.

Perception varied from one individual to another, and this was reflected in the pretreatment RPE and again

in the reduction levels at posttreatment. One's perception of physical exertion would seem to be of great importance in the choice of whether or not to continue the endurance activity. The treatment in this investigation caused perceptions of exertion to be reduced, and presumably this would enhance the choice to continue with the activity. Aspects of situations that may be perceived as threatening and debilitating may be reduced so that the same situation can be better tolerated (Kleinke, 1978; Miller, 1956). The present treatment was effective in helping subjects overcome their subjective assessment of discomfort during their endurance training. It is this discomfort that generally causes athletes to give up their control over performance to the discomfort (i.e., discomfort causes cessation of training). However, in this investigation athletes were taught, via their psychoeducational strategies to exert personal control over their own performance, particularly in aversive conditions. The cue for beginning the control over the discomfort was the discomfort itself.

Group Treatment Effectiveness

$\dot{V}O_2$max. and RPE

Reductions in RPE may logically be expected if an improvement in physical capacity at endurance workloads occurs. Estimations of effort intensity at levels previously believed strenuous would be expected to be reduced as the ability to sustain increased levels of exertion is

improved. Results showed significant posttreatment increases in $\dot{V}O_2max$. However, using ANCOVA design in which $\dot{V}O_2max$. was used as the covariate, thus partialling out its effect from the overall treatment effect, the alteration in RPE scores were significant. This indicated that physiological improvement alone did not cause the reduced posttreatment RPE.

Posttreatment RPE results indicate that, because a decrease in perception of effort intensity took place with physiological condition held constant, there must be other influences affecting the subjective estimations of exertion.

RPE decreases occurred at all 2-, 4-, and 6-min. intervals from pre- to posttreatment. The exact location could not be determined by the Tukey method. However, estimations of means at pre- and posttreatment 2-min. intervals indicated greater reductions were apparent at the 6-min. interval posttreatment. So, generally decreases at posttreatment were no greater at 2-min. than at 4- or 6-min. Individuals may feel the need to cope at different stages in their performance. Athletes who are not so highly trained as others will reach their maximal level sooner and will not be able to sustain performance at this level for as long as the more highly trained athlete. Therefore, the lesser trained athlete may have cause to initiate the strategy earlier.

As previously indicated, significant RPE decreases occurred at posttreatment irrespective of physiological condition. Treatment effects must have depended on other variables which affected perception. The psychological variables measured in this investigation were considered important to treatment effectiveness and acceptance. The influence of single and combined psychological variables will be examined in the discussion.

Imaging Ability and RPE

Imaging ability was considered to be a factor affecting potential treatment acceptance in this investigation. Subjects were required to overcome mild discomfort that naturally occurs from endurance running, by exercising imagery control. The treatment images served as task-relevant distractive techniques to reduce attention on the discomfort. Reduced attention leads to increased tolerance of discomfort (Horan & Dellinger, 1974). RPE posttreatment results of this investigation indicate that tolerance of discomfort was increased, and RPE was reduced. The ability to cope with constant workload levels and perceive them as reduced may be partially attributed to imaging as part of treatment effectiveness. The clarity and controllability of images can deceive the nervous system into responding in a manner consistent with the images. Therefore, the more vivid and appropriate the images the more naturally the responses will occur. Decreases in RPE were exhibited by subjects who generally

were vivid and well controlled. These particular results are supported by Gordon (1949).

Augmenter/Reducer and RPE

Treatment effectiveness indicated by RPE decrease may have been due to individual initial orientation toward pain and discomfort. Subjects who perceive physiological stress as less than it is (reducers) will tend to continue and endure hard physical exertion longer than subjects who perceive stress as it is, or greater than it is (augmenters) (Petrie, 1967). Reducer type behavior was exhibited by almost all the subjects. This may be a general characteristic of endurance athletes, as they are constantly being exposed to discomfort and fatigue in their attempts to extend and improve performance. Only one subject did not display reducer type behavior tendencies toward discomfort.

Treatment Acceptance and RPE

Effectiveness of the treatment relied upon various psychological characteristics, and ultimately the learning and acceptance of the treatment. Familiarity with the content of the treatment was essential. In order to reduce perception of fatigue, the experience of coping must arise from techniques that are well-learned. Firstly, subjects must be able to cope in non-stressful situations, and only then can the response be transferred to more stressful situations. The coping response must be an almost automatic response (Benson, 1976; Suinn, 1972).

More specific to the current investigation, Horan and Hackett (1980) demonstrated that pain tolerance did not increase unless subjects rehearsed or learned the treatment designed to help tolerate the pain. In fact, the subjects in their study were not given sufficient time for learning the treatment (Horan & Hackett, 1980). The learning time for the current investigation was 21 days of listening to the taped strategies and utilising them in endurance activities. Effectiveness may have been reduced for some subjects due to their lack of adequate practice, although they generally reported to be dedicated to the learning and practice of the treatment.

Individual Treatment Effectiveness

$\dot{V}O_2$max. and RPE

Subjects with improved aerobic capacity (AG, MaM, MeM, ST, and CV) would be expected to perceive decreases in exertion at the posttreatment test. This is likely as improved physiological condition would mean that the same absolute workload would require a lower percentage of maximal aerobic capacity. The apparent reduction in effort to perform at levels previously believed as strenuous would be likely perceived as such by the athlete. However, these subjects' RPE at posttreatment were not reduced greater than subjects who had no $\dot{V}O_2$max. increase.

The significant increase in $\dot{V}O_2$max. was not observed by all subjects. Seven (DD, PL, CM, MR, JM, ES, and

MS) of the 12 athletes did not improve their $\dot{V}O_2$max. more than 3 ml/kg/min. All except JM and CM perceived decreases at least at one 2-min interval at posttreatment. At 6-min. PL and MR preceived a decrease of three points. For the subjects with no physiological improvements the decrease in RPE cannot be attributed to the physiological parameters incorporated in $\dot{V}O_2$max., and therefore must be attributed to psychological factors.

PL and MR both perceived decreases in RPE posttreatment at 6 min., but neither had $\dot{V}O_2$max. improvements. These decreases may be attributed to initiation of the strategy at the 6-min. interval. Perhaps PL and MR were not sufficiently fatigued at the 2-, and 4-min. interval to require the use of their strategy. Throughout the learning and daily practice of the strategies, subjects recognised the onset of physical discomfort as the cue to begin coping with it. Until the 6-min. interval, there may have been no discomfort and, therefore, no reason to use any coping technique. The 6-min. interval may have been sufficient to warrant the initiation of the strategy.

Imaging Ability and RPE

Subjects who were classified on the Betts scale as very vivid were PL, MeM, ST, and CV. All except MeM perceived posttreatment decreases in the rate of exertion. PL and ST appeared to be particularly successful in using the strategies to reduce RPE, as their scores were reduced at each 2-min. interval, with the 6-min. interval being the

most distinct. MS was the most vivid imager in the group, but perceived only a 1-point decrease in RPE. However, her RPE was very low at all intervals. Her failure to estimate exertion any lower may have resulted from the verbal anchors of the numerical ratings on the Borg scale. A large subjective difference may have existed for MS between "somewhat hard" (12, 13, 14) and "fairly light" (9, 10, 11).

Subjects DD, MaM, and MR were moderately vivid in their imaging ability. All experienced a decrease in posttreatment RPE, MaM and MR very considerably so. The remaining five subjects (AG, JM, EE, CM, and ES) were considered limited in their ability to image vividly. Their posttreatment RPE reductions were not as distinct as subjects classified as moderately vivid or vivid. EE was least vivid of all and only experienced a 1-point decrease in all RPE trials. AG perceived her effort intensity the same in both pre- and posttreatment tests. For these five subjects lack of imaging ability seems to be a disadvantage in maximising the impact of the cognitive treatment. Maltz (1960) indicated that the more vivid the imagery the more likely the nervous system will be to respond in the desired and appropriate manner. Therefore, the effect of the cognitive strategy may be reduced due to limited imagery, and presumably perception of exertion would not likely be decreased. Also the chance of making the decision to stop running due to discomfort and pain

would be increased more so than for subjects whose imaging ability allowed them to maximise the effects of the cognitive strategies.

Directly related to the discussion of imagery vividness is the influence of imagery controllability. Gordon (1949) suggested emphatically that controllability of images was most important in enhancing performance. She indicated that the most conducive condition for improving performance through imagery was vivid-controlled and the least conducive was vivid-uncontrolled. On that basis MS and CV were the perfect imagers, in that they were both vivid and well controlled in their imagery. Their potential indicated by this information however was not realised by their RPE scores. Vivid and well controlled imagery was also exhibited by MR, ST, MeM, PL, CV, and DD, and of these only MeM failed to perceive any decrease in effort intensity.

MaM was predicted to be the least likely to make effective use of the treatment as her imaging ability categorised her as vivid-uncontrolled (Start & Richardson, 1964). Yet, MaM did perceive a reduction in exertion, therefore, for her, other factors unrelated to imaging ability appeared to be important to treatment effectiveness and acceptance. MaM was also a reducer and was particularly dedicated to the treatment practice. This may have accounted for her posttreatment RPE decreases. Subject EE was least vivid and controlled in her imaging and her RPE scores reflected this condition at posttreatment. She

had no decreases in her effort intensity perceptions except one point at the 4-min. interval. Her low level imaging ability gave little feedback substance for her nervous system to respond to (Jacobson, 1938).

In summary, imagery vividness and controllability appeared to be major influences for some subjects in treatment acceptance and effectiveness. Subjects MR, ES, DD, PL, and ST had vivid and controlled imagery and decreased RPE posttreatment and, therefore, appeared to utilise the treatment effectively. Their strategies comprised images that were meaningful and had successful connotations for them. Subjects CV, JM, and CM had similar imaging abilities and yet underwent only negligible decreases during treatment. Other psychological factors accounted for their apparent lack of total treatment acceptance. Dramatic reductions in perceptions for Subject EE would have been surprising considering her imaging ability alone. She had neither vivid nor well controlled images and her RPE did not change. MaM would be considered vivid-uncontrolled, a hazardous combination for effective performance enhancement (Start & Richardson, 1964). However, her RPE indicated otherwise. This suggests that the claim for controllability of images as a major influence on performance enhancement is not totally supported (Gordon, 1949; Start & Richardson, 1964). Subject MaM's RPE were decreased and this leads to the

conclusion that vividness of imagery is the more important factor.

Subjects' natural orientation toward physical discomfort (a frequent part of endurance training in track today), personal commitment, and attitude toward the use of psychoeducational techniques for performance enhancement must also be considered. The subjects who perceived decreases in RPE but did not have good imaging ability will be discussed in the following sections.

Augmenter/Reducer and RPE

Of those subjects who were classified as reducers (AG, MaM, MeM, MR, ST, CV, PL, ES, and DD), only two failed to perceive reductions in exercise intensity. AG's perception remained the same and MeM's perceptions increased. If they were already reducers and used their own strategies to overcome discomfort, then they may have already reached their maximum "reducing" level. The influence of previous experience with coping strategies may have diminished and limited the effectiveness of improving cognitive control over physical discomfort. The new coping strategies these subjects practiced may not be as well learned as the old strategies. Previously, when the workload of running got intense, AG would image herself running with others who impressed her, and would attempt to emulate these people. If this strategy was more familiar and meaningful to her than the new one, then this may have accounted for no change in perception.

Three subjects (EE, JM, and CM) revealed correlations which did not closely adhere to either augmenter or reducer type. They each perceived some degree of reduction in exertion intensity at posttreatment, although this was very limited for EE.

Individual awareness of cognitive restructuring differed greatly between subjects prior to this investigation. The majority of subjects did not realise that they could in fact control their own responses to the discomfort experienced during running. Responses to discomfort were equally as influential as responses to boredom in the choice of discontinuing physical exertion. For the long distance runners and walkers (MeM, CV, ST, and CM), this was a distinct problem. The strategies helped provide the interest and motivation to continue, not only for one particular race, but for their whole season of competition.

The treatment was directed toward personal control by reducing perception of discomfort, which may force cessation or inhibition of performance for trained athletes. Subjects indicated on the post-season evaluation that they all felt more in control of their performances and responses over fatigue and did not now stop as readily as they did before the treatment.

The treatment was effective in reducing RPE in practice and performance at some time for nearly all the subjects. RPE decreases were only apparent for those

who were totally committed to daily practice and behavioral change. A number of athletes did not have the dedication or perhaps the belief that the treatment could work for them, and this may have reduced the effectiveness of the treatment for them. The committment was essential as the techniques had to be well learned and familiar if their effectiveness was to have any impact in real-life situations. In this investigation not all the athletes were committed to the treatment and this was reflected in their final RPE.

It is difficult to assert the psychological variables that were more important to the treatment acceptance for individuals. However, this investigation was considered meaningful and a great motivational asset to workouts and performances for these athletes.

Summary

Personalised psychoeducational strategies were utilised in an attempt to alter perceptions of exertion (RPE). Eleven of the subjects perceived decreases in RPE at some interval during the posttreatment testing. The degree of effectiveness varied for each subject and was influenced by different psychological factors imaging ability (i.e., vividness and controllability), individual orientation toward discomfort of endurance running, and acceptance of cognitive restructuring techniques. Subjects' committment to the treatment was very important to its effectiveness.

Chapter 6

SUMMARY, CONCLUSIONS, and RECOMMENDATIONS FOR FURTHER STUDY.

Summary

Personalised psychoeducational strategies were practiced for 21 days by female endurance athletes. The strategies were developed in an attempt to alter the rate of perceived exertion at 80% predicted max. HR exercise intensity. Baseline measures of RPE were recorded every 2 min. for 6 min. during treadmill testing. Posttreatment RPE were recorded at the same workload and at the same time intervals.

$\dot{V}O_2$max. was measured prior to the treatment and again at the conclusion of treatment practice. The physiological data were collected so that any change in RPE from pre- to posttreatment could be attributed to the psychoeducational strategies and not to increased aerobic capacity.

Psychological measures were taken to assist with the interpretation and discussion of the results of RPE. They included measures of imaging ability and initial subject orientation toward discomfort (i.e., discomfort associated with endurance activity). Subject profiles were correlated with augmenter/reducer prototypes. $\dot{V}O_2$max. and RPE were analysed by ANCOVA, while the psychological data were analysed subjectively.

Treatment was considered to be effective from a group and individual perspective, even though $\dot{V}O_2$max. improved.

Individual treatment effectiveness resulted in degrees of success. It was observed that eleven of the 13 subjects perceived decreases in RPE from pre- to posttreatment.

Conclusions

1. Psychoeducational strategies are effective in reducing the rate of perceived exertion.

2. The effect of psychoeducational strategies is enhanced by imaging ability, particularly vividness.

3. The effectiveness of psychoeducational strategies is dependent on individual acceptance and orientation toward cognitive restructuring.

4. Treatment effectiveness is enhanced by having a reducer type disposition.

Recommendations for Further Study

1. Future studies should involve larger samples.

2. Treatment practice time should be extended.

3. Rate of perceived exertion should be examined over a longer period and increased intensity,

4. Imagery vividness and controllability should be retested posttreatment to evaluate any changes in ability across the treatment period.

5. Augmenter/reducer profiles should be retested posttreatment to determine any change in orientation toward discomfort across the treatment period.

6. Treatment should be administered to subjects who exhibit augmenter profiles, or reducer profiles.

Appendix A

INFORMED CONSENT FORM

We are in the process of conducting research concerning the rate of perceived exertion, that is, the subjective estimation of intensity of effort. The study is designed to assess whether or not individualised cognitive strategies can modify perception of effort.

Acceptance into this study involves a commitment to the following:

Day 1: Introduction to the testing instruments. Treadmill practice and Rate of Perceived Exertion measurement (RPE), at 3 submaximal workloads (2 min. each), Betts QMI Vividness of Imagery scale designed to assess the degree of vividness of mental imagery (12 min.), Gordon Test of Visual Imagery Control designed to assess the ability to control images (5 min.).

Day 2: Interview with investigator to discuss the role of imagery and cognitive strategies, also to ascertain present personal coping strategies (60 min.).

Day 3: Repeat of RPE testing (12 min.).

Day 4: Test of maximal oxygen uptake (40 min.).

Day 5: RPE at 80% predicted maximal HR at 8 mph on the treadmill. First night of listening to cassette tape of strategy.

Appendix A (continued)

Day 5-25: Practice of treatment, listening to the tape and utilising the strategy during regular workouts.

Day 8, 12, 20: Telephone or personal communication to discuss the strategy.

Day 14: California Q-set, which involves the sorting of 100 personality descriptors to measure values of autonomy and independence (20 min.).

Day 26: RPE measurement at 80% predicted maximal HR.

Day 27: Test of maximal oxygen uptake.

Day 28: Post-season evaluation of the treatment.

Throughout this investigation subjects will be asked to record daily their involvement and acceptance of the treatment.

We wish to emphasise that the data will be utilised for research purposes only. Participation is voluntary no one need participate. Initial acceptance does not commit you to continue participation and you may withdraw at any time.

The measurement of maximal oxygen uptake ($\dot{V}O_2max.$) is a stress test and some researchers have found that there is a risk of cardiac and skeletal injury (Lester, cited in Astrand & Rodahl, 1970). Dr. D. P. Thomas will be present at all $\dot{V}O_2max.$ testing and subjects may break off the testing before reaching their maximal level if needed.

Appendix A (continued)

All athletes should have medical release from the Health Center to participate in team athletics.

Please consider the purposes of this study, the time commitment and introspective nature of the inventories before you decide to participate. Please indicate your decision below. Thank you for your time thus far.

Janice Satterley, Graduate Student.

A. Craig Fisher, Thesis Advisor.

D. Paul Thomas, Committee Member.

_____ YES, I wish to participate in this study.

_____ NO, I do not wish to participate in this study.

_____ Signature. _____ I am over 18 years.

Appendix B

TREADMILL DIRECTIONS

You are going to run on a treadmill. We want you to estimate how hard you feel the work is; these estimations represent your ratings of perceived exertion. Do not concern yourself with any one factor such as leg fatigue or shortness of breath but rather try to concentrate on your total inner feelings of exertion. We will be asking you for ratings of perceived exertion at points throughout the duration of the test. A rating scale will be provided and you will be asked to indicate your perception of effort by stating the appropriate value.

RPE scale

6

7 very, very light

8

9 very light

10

11 fairly light

12

13 somewhat hard

14

15 hard

16

17 very hard

18

19 very, very hard

20

Appendix C

FEEDBACK SHEET

Please provide your best and most accurate responses or recollections to the following questions. The more revealing you can be, the better will be the strategies that we create with you.

1. How do you currently deal with fatigue (i.e., when you feel like stopping how do you force yourself to continue running?). Describe your inner talking strategies and any pictures you create.

2. When fatigue begins to set in, where do you first notice it? Describe in a little detail the feelings you experience.

3. If you slow down or stop before your running task has been completed, what promotes this decision of yours?

4. What would make you a better runner, and what would you like your involvement in this project to do for you?

Appendix D

RESPONSES TO FEEDBACK SHEET

DD

1. I think about that I've gone this far before, so I know I can do it again. I break up my running into $\frac{1}{4}$-$\frac{1}{2}$ way points. Then I can look back at how far I've gone and how much is left. If it is sunny, I think about how nice the sun feels and then that leads me to thinking about laying out in the sun on a beach. Sometimes I pray to God either to let me finish or about other problems. Mainly with interval workouts. I see how others are going so fast or are able to manage the workout, so I tell myself that I should be able to. When I get really tired, I try to convince myself that that it's good for me and this will help me in the race.

2. Calves usually, especially with hills. They tighten up and seem to restrict my stride. They gradually loosen and I'm okay for a while, then I start to breathe hard and my legs get really tired.

3. Give up, decide I'm tired of running, I'm not achieving anything by this. Or sometimes I think I've gone far enough, more than someone else, and I'm happy with that but then I regret it afterwards.

4. I'm not sure what would make me a better runner more endurance for sprint work maybe. I know that I should be able to run well because of my build, but something has kept me from being good. I don't know what though.

Appendix D

(continued)

EE

1. When I begin to tire I first say to myself to try and run it off, but when that doesn't work, I start to think I'm a lazy bum, and I never can do anything right, so it figures I would want to stop. To push on I try to stop thinking that I'm running and think of good times I had with my boyfriend in high school, and I imagine him waiting at the finish line for me and the only way I can get to him is to continue.

2. When I first feel tired it starts across my back, by the shoulders, and my legs feel like there has been an extra 10-lb wieght attached to each. Then I begin to feel like I can't breathe in enough C_2 so my lungs start to hurt.

3. If I stop before the running task has been completed it is because I have made a deal with myself that if I push to a point I can stop there.

4. To beat the school record in the hurdles and to improve my own time.

Appendix D

(continued)

AG

1. I have a few different talking strategies. Sometimes while running long distance, I try to trick myself into not knowing how far I am running or have already run. I do this by thinking of all the things that I have to do that day and mentally preparing my schedule in detail. This works only on long runs when I don't have to pay attention. When I feel like stopping I think of people I've run with who seem to have great drive and whom impressed me. Then I yell at myself to be strong like them and do it for them, then I get even madder and say I should be doing it for myself. A lot of times I also think that I've run and worked this hard and it can't be all for nothing. I have to improve my time no matter by how little.

2. At different times I notice pain in different places during workouts involving sprints or intervals I usually feel it in my breathing. Distance runs, I feel it in my legs. They feel heavy. I do not feel fatigue except in my mind, I'll be running and feel okay, but sometimes I am anxious to get it over.

3. I don't like to stop too often as I am kind of superstitious and I know that if I don't finish a workout then I won't be good in my next race and don't

AG (continued)

deserve to.

4. I think I'd be a better runner if I had more drive and no ideas of stopping while I'm running. Also if I could think more positively about running for myself instead of worrying about others. I also get too nervous and uptight before a hard workout or a race and I worry about it and think before I do it how difficult it will be and what if I can't do it. I'd like to eliminate these anxieties.

Appendix D
(continued)

PL

1. I can keep myself going while doing sprints fairly well by imagining a competitor in front of me. When I go out on long distance runs though, I have difficulty keeping myself going unless it's really a nice day and I'm in beautiful surroundings. Since I'm going at a much slower pace for a longer time I feel my body fatiguing easier.

In a meet at high school a friend of mine was trying to get me psyched up for my hardest race and so he walked me through the last lap of a mile. He told me points I would do what and going into the last turn he told me to say "I think I can." I won that race by coming from behind and I've tried to remember this during other races since but I forget when the time comes.

2. Usually it's my thighs getting heavy and it feels as if my stride won't open up but is continually shortening, my arms feel heavy also as if they are becoming detached.

3. I guess I know I'm not performing well so instead of perservering through the rough part I become frustrated and psyche myself out. It's a mind game.

4. I would like to be able to always put out maximum effort and not worry about feeling fatigue. I would like to be more positive so that it would reflect in my performances.

Appendix D

(continued)

MaM

1. On a long run my knees begin to hurt and I know I'm in trouble. I usually say "If you stop early you're the biggest asshole on earth. Don't you have any self-respect?" Sometimes I just set small goals along the road, a telephone pole or a street sign, and keep promising myself to keep running until I reach that goal. I also think of a fat slob that's in crummy shape, which may be me if I don't run. When I really get tired I mentally picture myself as being pushed from behind by a gigantic hand to help sweep me along.

2. My knees hurt first, but in a sprint my thighs start to burn. The pain feels very deep and each step makes me more discouraged.

3. I usually think "Oh hell! Why are you doing this? Your breathing sucks and you're going so slow, why not take a rest?" The more I think about stopping the more aches I have, my knees hurt, thighs are heavy, breathing more uneven, then the easier it gets to stop and not feel bad about it.

4. My biggest problem is when I'm behind someone. I try to keep their pace but it seems impossible and I give up. So I'd like to feel I have that extra juice when I'm near an opponent.

Appendix D
(continued)

MeM

1. I try to tell myself that I'll get out what I put in and so stopping won't accomplish anything. I keep myself going by breaking down my run into smaller sections. I make what is like a picture in my head when I'm running It's of the future, someplace, sometime. I know I do this when I run up hills as they make me feel really tired. I just see myself in some race and am able to finish strong with a kick because I'd pushed in practice. I pretend I am being watched and that stops me from slowing down.

2. My knees hurt first on long distances, but for intervals my thighs hurt first, they really occupy my mind.

3. I feel like I've done enough and will do more next time. I slow down rather than stop as I always want to finish.

4. I need to be faster in practice, and be just like the better runners as I know I can do what they do. I just think that they are "better".

Appendix D

(continued)

JM

1. Usually I say " Come on you can finish this, you don't want to look bad in front of everyone." Or another one is "Jeez, if you can't finish this you might as well hang it up," or I say "If you want to be as good as you were you can't stop." Sometimes I see myself in the past when I was always winning.

2. My chest, shoulders and then my legs feel heavy. Heavy and tight and I can't seem to move them.

3. I usually talk myself out of it by saying "Why try, I'll never be as good as I used to be. Or everyone is better than me why should I finish this. I want to come in first not somewhere in the middle. Maybe I'm too fat or I'm not built like a runner, why should I be able to do this."

4. I would be better if I was more positive, and when I raced if I didn't think others were always better than me. I would like to be able to say, "Hey, you can do it."

Appendix D

(continued)

CM

1. When I start to think negatively about running I usually say "What if someone saw you going this slow." So I guess you could say that I try to impress. I don't like to think I'm going slow. Also, I try to tell myself that everyone is watching me. I also say to myself that I have to get skinnier to be faster, so the further and faster I run the more muscle I'll get. Then I picture myself looking nice and firm, I hate jiggling fat. I love to see muscles. I make myself feel guilty if I stop as if I let myself down.

2. During a race my shoulders tend to hike up and my arms, and I pull back, like I'm moving away from the finish line.

3. I usually don't stop. I don't let myself. I may cut down on weekend practice as it gets lonely. I like to run with someone.

4. My coach and mother told me that I could be any type of runner, I just have to believe it. Sometimes I do but not constantly. I'm very competitive and don't like being behind even if it may an advantage. I WANT TO BE IN CONTROL OF THE SITUATION.

Appendix D

(continued)

MR

1. Sometimes I try and forget I'm running. I think of the past or future events. I may repeat prayers or songs or even the alphabet. I often think "What's coach going to think? Please make me go faster, it's only one more lap. Relax, slow your breathing, swing your arms. You can't let David down." "I want that 5-minute mile and this is your last year. The last chance to be good. It'll feel so good when it's over. When I'm passed I instantly feel tired and the farther back I get the worse I feel.

2. My thighs start to feel heavy, and my arms feel awkward and I have to concentrate on using them well.

3. I have no desire to go on. It usually happens when I don't want to run anyway. When I'm behind I find excuses to stop.

4. I need a more positive attitude and more confidence in myself. I've decided a long time ago how good I can be and I can't seem to break away from that. I want to develop my dealing with pain beacuse I'm a pretty "wimpy" runner when it comes to pain.

Appendix D

(continued)

MS

1. The only times I really feel like stopping are on long distance runs. This may be because I am not a long distance runner. However, I feel like stopping usually depending on how I feel that day. If I am tight, it's usually because I am upset about something. Then I feel like stopping right through my run. I try to think about races, and this gives me an escape and before I know it I'll be able to stop.

2. Lately I feel fatigue first in my chin. It begins even before I run. It does not stop my workout and during the latter part it won't bother me at all.

3. Either I'm extremely sick or injured.

4. What may make me a better runner would be to overcome the pain I feel while running the 400m hurdles, or to overcome it enough to allow me more speed. I would like to be more relaxed during competition.

Appendix D

(continued)

ST

1. In order to keep going I focus on the positive outcome of my exercise. I think of how strong I am, and my health is benefited in the long run. I think of the records that I will break or set. I love to read the newspaper reports after track meets and am elated to see my name in print. When practicing my sprints I think of my "kick" at the end of a good race. I race against the clock and imaginary opponents, and go faster by imagining an arch rival next to me. If I don't beat her I won't go to states. I often think of making the state meet to make myself work harder.

When I'm in a race I concentrate on my form and think about my stride and body position. I forget about the pain. In a race I gain support from the crowd. I'm very "first-place happy" and I hate to lose. When I'm pressured I focus on the winner's trophy and how much I want it. I have won races this way by pushing to a limit I didn't know I had.

2. Fatigue usually sets in first in my lower legs, ankles and feet. Race walking puts a great strain on the lower leg. My steps no longer feel smooth, even heel-to-toe rolls. It feels flat-footed. Arm swing is very important in walking and after a while my shoulders feel very heavy and stiff. The muscles in

Appendix D

ST (continued)

my neck become tense. If I'm really straining, the pain finally settles in my chest. The pain comes with each breath. It's a sharp pain, very piercing.

3. My mind calls a halt to the amount of pain that I'm prepared to endure. I become frustrated, and my breathing is raspy and shallow, it snaps my mind and convinces my body to stop. I may be totally displeased with myself and yell at myself, wimp, loser, baby, and just an all-round jerk for not being able to reach a daily goal.

I am my own worst enemy, and may expect too much of myself, but if I don't achieve these expectations then I feel I have wasted my time.

4. I feel I would be better if I could only think of things important to the race. I must convince myself I can reach my full potential, it is possible. I would be a better athlete if I could block out any negative feelings. I would like to be able to channel my thoughts into productive resources for racing. I feel it can help to build a mind that is strong enough not to snap or break.

Appendix D

(continued)

CV

1. When I start to feel tired, I tell myself to just go a little further. I set up short distances as my goal. This continues until I finish what I wanted to. Another thing that I do is say " C, don't be a loser, keep going." I've never created any pictures or motivating images, but maybe it would help.

2. I first notice fatigue in my knees. They get an aching on the inside of the knee itself and I also get a soreness on the outside.

3. I say "What's the use; why should I kill myself?" After I slow down or stop my legs seem to say "Thank you."

4. I think that if I was able to be "boss" and was able to ignore the inner talk telling me to give up, I would get more out of my training. I would like to improve my running through any means.

Appendix E

PART III DIALOGUE

DD

Picture yourself during a workout. As you perform, keep uppermost in your mind that the fatigue you initially feel is nearly entirely psychological, and that this "mind fatigue" is transferred into physical symptoms. This fatigue you can deal with because you have control over your thinking, and you have a breathing strategy to initiate your feelings of success from your previous experiences. You can cope with the ensuing feelings of tiredness. As you continue your workout, your calves tend to tighten and your stride becomes shorter and constricted. Do you recognize this feeling? Can you recall this feeling right now? Use this feeling as a cue for you to begin to exert personal control over the situation. Do this by focusing on your breathing. Inhale . . . hold it . . . exhale. Inhale . . . hold it . . . exhale. Begin a breathing and counting exercise. Inhale . . . say "1" . . . exhale. Inhale . . . say "2" . . . exhale. Inhale . . . "3" . . . exhale. Continue this pattern until the count of 20. Now that you are in control, notice that your calves are more relaxed and that your stride has returned to its smooth, long, and rhythmical style. As you continue your workout, when your breathing becomes difficult and your legs get tired initiate your breathing strategy. Inhale . . . "1" . . . exhale. Continue until you are back in control. This

DD (continued)

breathing relaxation strategy will allow you to push fatigue into the background. The fatigue doesn't control you; you control it. There's a real sense of satisfaction knowing your're in charge, isn't there? Be careful not to reduce your control by quitting. Think about how bad you feel and how much you regret it later. Realize that the only remedy is to keep going. Commit yourself to excellence in every workout and give your maximum intensity to the performance. Don't let your inner talker confuse and scare you with such comments as, "I'm tired of running," "I'm not achieving anything," "I've gone far enough," and "It's more than anyone else did." Recognize that your inner talker is trying to take control out of your hands. Don't allow it! Use the comments to initiate your breathing strategy. Don't ignore the comments. Instead, use the comments to initiate your breathing strategy. Focus on your breathing. Inhale . . . "1" . . . exhale. Continue until you feel back in charge. Make the task of running distance less difficult by setting short distances as your goal (for example a tree, a post, or some landmark). Stay focused only on this immediate goal, don't look beyond it. Once you bypass your first goal, choose another one and continue to focus on that one. This strategy really brings meaning to a recent song: "Another one bites the dust . . . and another one, and another one . . . another one bites the dust." When the going gets tough travel in your mind

DD (continued)

to your beach scene. Feel the warm sun relax you, or if you prefer let the cool breezes cool you. Recall how you feel lying on the beach. Who is with you? What are you doing? Are you making any plans? If not, why not make some plans or set some goals? What are your goals for your track involvement? How hard are you prepared to work? When you commit yourself fully to the task, you will see yourself fully in control. You see, success is really compared against the degree of commitment you're willing to set. You feel that something has kept you from being good, but you're not sure what. Is it possible that you haven't made an adequate commitment to yourself to maximize your abilities? Your inner talker tries very hard to get you to give up a little. Why not fight back with your strategies? Your past successes reinforce that you can achieve greater heights if you'll just unleash the power and control you already possess. Be the runner you want to be. Go for the gold! Work on your strategies, develop your powerful positive affirmations to the fullest. Your strategies will be effective, and they will improve as you spend time learning and using them. As the music tune into your feelings of being in control of the situation. Perform your workout and feel the symptoms of fatigue. Test yourself. Trust yourself. Reinforce yourself for having coped with fatigue and your negative inner talker. You feel good when you're in charge.

(Selection from Jonathan Livingston Seagull, 3:38 min.)

Appendix E
(continued)

EE

Picture yourself during a workout. As you perform, keep uppermost in your mind that the fatigue you initially feel is nearly entirely psychological, and that this "mind fatigue" is transferred into physical symptoms. This fatigue you can deal with because you have control over your thinking, and you have a breathing strategy to initiate your feelings of success from your previous experiences. You can cope with the ensuing feelings of tiredness. As you continue your workout, you begin to notice the feelings of tiredness across your back and in your shoulders. As you continue the fatigue seems to locate itself in your legs, just as if a 10-lb. weight has been added. This is your cue to exert your personal control. Focus on your breathing. Inhale . . . hold it . . . exhale. Inhale . . . hold it . . . exhale. Begin a breathing and counting exercise. Inhale . . . say "1" . . . exhale. Inhale . . . say "2" . . . exhale. Inhale . . . say "3" . . . exhale. Continue this pattern until the count of 20. This strategy will allow you to continue and push the fatigue into the background. As you continue, picture how proud John would be of your personal strength. He knows how much your body wants to quit, but you show him and yourself that you are too powerful to give up. Congratulations. As your workout becomes longer,

EE (continued)

your effort leads to some breathing problems in that it is difficult to take in enough oxygen. Initiate your breathing strategy and cope with the fatigue. Concentrate on the good feelings you have of yourself and the feelings John would have of you. What would he say? What would he do? How would you react to his appreciation of your performance? As your inner talker begins its negative dialogue, with such comments as "you lazy bum," "you never do anything right," and "why don't you just quit?," realize that this is just a game that is being played on you. Recognize it, and use the negative comments as cues to initiate your breathing technique, followed immediately by a focusing on a successful experience. Don't make any deals with the inner talker to run so far, and then you can quit. Set your goal initially and totally commit yourself to it. As you train, set up short distances as your goal (for example a tree, a post, or some landmark). Stay focused only on this immediate goal, don't look beyond it. Once you bypass your first goal, choose another one and continue to focus on that one. This strategy of your's really brings life to a recent song: "Another one bites the dust . . . and another one, and another one . . . another one bites the dust." Remind yourself constantly that you want to improve your running times and eventually set the Ithaca College record in the hurdles. Can you see yourself immediately upon achieving that goal? With whom

EE (continued)

would you share this accomplishment? Picture the scene. Make it vivid. Have it come alive. The effort was certainly worth it, wasn't it? Commit yourself to the excellence you desire. Go for it! Your strategies will be effective, and they will improve as you spend some time learning and using them. As the music plays, tune into your feelings of being in control of the situation. Perform your workout and feel the symptoms of fatigue. Cope with them. Use your strategies. Test yourself. Trust yourself. Reinforce yourself for having coped with fatigue and being in control. You feel good when you're in charge.

(Selection from Jonathan Livingston Seagull, 3:38 min.)

Appendix E
(continued)

AG

Picture yourself during a workout. As you perform, keep uppermost in your mind that the fatigue you initially feel is nearly entirely psychological, and that this "mind fatigue" is transferred into physical symptoms. This fatigue you can deal with because you have control over your thinking, and you have a breathing strategy to initiate your feelings of success from your previous experiences. You can cope **with**the ensuing feelings of tiredness. As you continue your workout, pay attention to where you begin to feel the fatigue first. As soon as you begin to feel a heaviness in your legs, this is your cue to cope and exert personal control over the situation. This heaviness will have a tendency to restrict your stride, constrain you, and give you some anxious moments. Deal with this feeling by focusing on your breathing. Inhale . . . hold it . . . exhale. Inhale . . . hold it . . . exhale. Begin a breathing and counting exercise for relaxation purposes. Inhale . . . say "1" . . . exhale. Inhale . . . say "2" . . . exhale. Inhale . . . say "3" . . . exhale. Continue this pattern until the count of 20. This strategy will allow you to relax whenever you need it. As your workout continues and it gets more difficult to continue, it is very natural to have thoughts of quitting. **Everybody has them, even those**

AG (continued)

runners you admire. These negative thoughts and worries about others are products of your negative inner talker, and are used to test you. You have the control and strength to use these messages as cues to relax and overcome the barriers placed in your path. There is an extremely important payoff to commiting yourself to excellence and not giving in to your fatigue or anxieties--it's called self-respect. Not only that, it's important to complete every workout at the maximum intensity you can muster. Realize that you can always do more than you think you can do. Think of some examples of situations in which you exceeded your expectations. Maybe you were surprised; I guarantee you were pleased with yourself. When the going gets tough, it's OK to trick yourself with the distraction exercises you already use. Plan your weekly schedule, plan a month-long vacation to the South Seas, decorate your house, plan your wedding, or whatever else works for you. Picture yourself training with others that you respect. Who are they? You respect them for their drive. Associate yourself with these excellent models. Realize that they face the same problems that you face, they become fatigued, they want to quit, their inner talker plays disastrous games with them, but they continue because they have made a commitment to excellence. When you make your personal commitment to excellence, you will unleash the power and control you have over your behavior.

AG (continued)

You will give more effort to your training and you will reap the benefits. When you do this you will gain the respect from others, and you will become a powerful model on which less dedicated runners can depend. Impress and infect others with your intensity and dedication and you will impress yourself. Dedicate yourself to be your own person. This is your choice to be involved with track. Always perform in a manner that will make you proud of what you've done. Your strategies will be effective, and they will improve as you spend time learning and using them. As the music plays, tune into your feelings of being in control of the situation. Perform your workout and feel the symptoms of fatigue. Relax away your anxieties with your breathing strategy. Use your strategies. Test yourself. Trust yourself. Reinforce yourself for having coped with your anxieties and fatigue, and for being in control. You feel good when you're in charge.

(Selection from Jonathan Livingston Seagull, 3:38 min.)

Appendix E

(continued)

PL

Picture yourself during a workout. As you perform, keep uppermost in your mind that the fatigue you initially feel is nearly entirely psychological, and that this "mind fatigue" is transferred into physical symptoms. This fatigue you can deal with because you have control over your thinking, and you have a breathing strategy to initiate your feelings of success from your previous experiences. You can cope with the ensuing feelings of tiredness. As you continue your workout, you begin to notice a tired feeling in your thighs. They appear to get heavy and restrict the length of your stride. When this happens, use these cues to begin to exert your personal control. Focus on your breathing. Inhale . . . hold it . . . exhale. Inhale . . . hold it . . . exhale. Begin a breathing and counting exercise. Inhale . . . say "1" . . . exhale. Inhale . . . say "2" . . . exhale. Inhale . . . "3" . . . exhale. Continue this pattern until the count of 20. Now that you are back in control, focus on how much longer and smoother your stride is. The heaviness has also left your arms because your stride lengthened out. Let your breathing strategy initiate a positive inner dialogue, "I think I can . . . I know I can . . . I knew I would." You have all the control and all the power you need to deal with the fatigue feelings. All you have to do is unleash it

PL (continued)

with your breathing strategy. Don't limit yourself. Commit yourself to excellence in every performance. It's normal to become frustrated when you encounter the rough parts of a workout or race, but reduce your frustration first by initiating your breathing strategy and then by uttering your positive dialogue, "I think I can . . . I know I can . . . I knew I could." Don't compare this performance to any other. Maximize this one as if it's the first day of the rest of your life. Effort is completely volitional, it's entirely under your control, and it's up to you to commit yourself to excellence and release this effort in order to maximize your success. Do it! Fatigue is part of the track experience, you already are well aware of that. Recognize fatigue for **what it is--a natural** outcome of effort expended--**use the feeling as a cue to** cope. Don't worry about fatigue, just let the feeling tell you it's time to cope. Your strategies will be effective, and they will improve as you spend some time learning and using them. As the music plays, tune into your feelings of being in control of the situation. Perform your workout and feel the symptoms of fatigue. Test yourself. Trust yourself. Reinforce yourself for having coped with fatigue and being in control. You feel good when you're in charge.

(Selection from Jonathan Livingston Seagull, 3:38 min.)

Appendix

(continued)

MaM

Picture yourself during a workout. As you perform, keep uppermost in your mind that the fatigue you initially feel is nearly entirely psychological, and that this "mind fatigue" is transferred into physical symptoms. This fatigue you can deal with because you have control over your thinking, and you have a breathing strategy to initiate your feelings of success from your previous experiences. You can cope with the ensuing feelings of tiredness. As you continue your workout your knees begin to hurt, and this is followed by a burning sensation in your thighs. Can you feel these sensations? Rather than giving in to the pain, deal with it by exerting your personal control over the situation. To do this, focus on your breathing. Inhale . . . hold it . . . exhale. Inhale . . . hold it . . . exhale. Begin a breathing and counting exercise. Inhale . . . say "1" . . . exhale. Inhale . . . say "2" . . . exhale. Inhale . . . "3" . . . exhale. Continue this pattern until the count of 20. As your workout intensifies, your inner talker bombards you with all kinds of comments to get you to quit. You hear such things as, "If you stop early, Maureen, you're the biggest asshole on earth"; "Don't you have any self-respect?"; "Oh hell, why are you doing this?"; "Your breathing sucks and you're going so slow"; and "Why not just take a rest?" Some of

these statements seem to make quitting easier and apparently justifies mediocrity. Recognize these negative comments exactly for what they are--an unfortunate game that's being played. Choose not to play. Instead of stopping when you hear these comments, or getting upset, use the comments as cues to cope. This is where to exert your personal control. Initiate your breathing strategy and follow this with the visualization of the gigantic hand pushing you from behind. Can you picture the hand? It is supportive and protective, it cushions you from the fatigue. It also shuts out the negative dialogue from the inner talker. Let this soft, gigantic hand guide you to the completion of your task. Realise also that the hand has a speed dial. Just reach behind and turn the dial when you wish to be transported at a faster speed. As you train, set up short distances as your goal (for example a tree, a post, or some landmark). Stay focused only on this immediate goal, don't look beyond it. Or if you prefer, defocus your attention keeping this set goal in your mind's eye. Once you bypass your first goal, choose another one and continue to focus on that one. This strategy that you already use brings life to a recent song: "Another one bites the dust . . . and another one, and another one . . . another one bites the dust." When you are competing, don't compare yourself to your opponent. Doing that gives some of your control away. The only

person in this world that you are in charge of is yourself. Exert your own control by commiting yourself to the maximum effort and let the outcome take care of itself. Use your strategies to help you cope with the fatigue and your inner talker. Your strategies will improve as you spend time learning and using them in your daily workouts. As the music plays, tune into your feelings of being in control of the situation. Perform your workout and feel the symptoms of fatigue. Cope with them. Use your strategies. Test yourself. Trust yourself. Reinforce yourself for having coped with fatigue and being in control. You feel good when you're in charge.

(Selection from Jonathan Livingston Seagull, 3:38 min.)

Appendix E
(continued

MeM

Picture yourself during a workout. As you perform, keep uppermost in your mind that the fatigue you initially feel is nearly entirely psychological, and that this "mind fatigue" is transferred into physical symptoms. This fatigue you can deal with because you have control over your thinking, and you have a breathing strategy to initiate your feelings of success from your previous experiences. You can cope with the ensuing feelings of tiredness. As you continue your workout, your knees begin to hurt or your quads begin to hurt. These feelings pass through your body and work their way into your thoughts. Can you recall these feelings? These feelings are cues for you to begin to exert personal control over the situation. Focus on your breathing. Inhale . . . hold it . . . exhale. Inhale . . . hold it . . . exhale. Begin a breathing and counting exercise. Inhale . . . say "1" . . . exhale. Inhale . . . say "2" . . . exhale. Inhale . . . "3" . . . exhale. Continue this pattern until the count of 20. This strategy will allow you to continue and to push fatigue into the background. There is a real sense of satisfaction from knowing you're in charge of the situation, isn't there? As you are well aware "input = output" --you get out what you put in--"input = output" this message says that you can be as good as you want to be,

and the success equation is nothing more than giving more effort. Effort is volitional; you can turn it up or turn it down. Can you recall some past experiences when you exceeded what you thought you could? Make them alive. How many of these success experiences were the outgrowth of perserverance, hard work, and a realization that you could do it? When the going gets tough, recall one of these past successes and commit your present involvement to replicate that previous outcome. When you are distance training, **make the task less difficult by setting short distances** as your goal (for example a tree, a post, or some landmark). Stay focused only on this immediate goal, don't look beyond it. Once you bypass your first goal, choose another one and continue to focus on that one. This strategy of your's really brings meaning to a recent song: "Another one bites the dust . . . and another one, and another one . . . another one bites the dust." You have all the control and willpower you need to deal with the fatigue feelings and to keep up to others you are training with. See yourself running with all your teammates and notice that you are the front runner. As you begin to tire, you maintain control by using your fatigue feelings to remind you to initiate your breathing strategy. Beware of your negative inner talker who tries to persuade you that you have done enough forone day; after all there are other days. Recognize that this is a game that's being played. Have no

MeM (continued)

part of it. You must take your stand right here and commit yourself to farther and faster work. Do it now! Today is the first day of the rest of your life. Stopping won't accomplish anything. Before any workout begins, commit yourself to the maximum intensity you can muster and that you will work through the inevitable fatigue. Trust that you can finish what you start. Don't be overly concerned that, if you run faster, you'll not finish. Test yourself by choosing to run with a teammate whom you assess to run a faster pace than you. Keep up. The next day move on to the next ranking teammate. Maybe you won't always be faster, that's not the most important thing. What is important is that you are willing to challenge yourself to be better. All you need is the commitment to excellence. Start today! Work your success visualizations when you begin to lose hope. You've persevered and succeeded in the past and you can do it again and again. Your strategies will be effective, and they will improve as you spend some time learning and using them. As the music plays, tune into your feelings of being in control of the situation. Perform your workout and feel the symptoms of fatigue. Test yourself. Trust yourself. Reinforce yourself for having coped with fatigue and being in control. You feel good when you're in charge.

(Selection from Jonathan Livingston Seagull, 3:38 min.)

Appendix E

(continued)

JM

Picture yourself during a workout. As you perform, keep uppermost in your mind that the fatigue you initially feel is nearly entirely psychological, and that this "mind fatigue" is transferred into physical symptoms. This fatigue you can deal with because you have control over your thinking, and you have a breathing strategy to initiate your feelings of success from your previous experiences. You can cope with the ensuing feelings of tiredness. As you continue your workout, you feel a heaviness in your chest, shoulders, arms, and legs. The heaviness restricts the length of your stride and your entire movements feel constrained. Do you recognize this feeling? Can you recall this feeling now? Pay attention to the specific location of the heaviness sensations. Use these feelings as cues for you to begin to exert personal control over the situation. Focus on your breathing. Inhale . . . hold it . . . exhale. Inhale . . . hold it . . . exhale. Begin a breathing and counting exercise. Inhale . . . say "1" . . . exhale. Inhale . . . say "2" . . . exhale. Inhale . . . say "3" . . . exhale. Continue this pattern until the count of 20. This strategy will allow you to push fatigue into the background. There is a real sense of satisfaction from knowing you're in charge of the situation, isn't there?

JM (continued)
Beware of your negative inner talker who offers you all kinds of excuses to quit on yourself. Recognize the following typical comments you hear: "Why try? I'll never be as good as I used to be"; "I just don't have it in me to push"; "Everyone is better than me. Why should I finish this? I'm way behind and I hurt"; "I'm too fat"; "I'm not built like a runner. Why should I be able to do this?"; "Come on you can finish this, you don't want to look bad in front of everyone"; and "Jeez, if you can't finish this you might as well hang it up." Realize that your inner talker is playing a disastrous game with you. It's called, "Who's in charge here?" Choose not to play this stupid game. Instead, as you hear these comments, immediately begin to focus on your breathing. Inhale . . . say "1" . . . exhale. Inhale . . . say "2" . . . exhale. Continue this pattern until you feel more in control. Reduce the difficulty of your training task by setting short distances as your goal (for example a tree, a post, or some landmark). Stay focused only on this immediate goal, don't look beyond it. Once you bypass your first goal, choose another one and continue to focus on that one. This strategy of your's really brings meaning to a recent song: "Another one bites the dust . . . and another one, and another one . . . another one bites the dust. When the going gets tough, recall some success experiences from your past. Think back to a situation wherein you surpassed

JM (continued)

your expectations. How did you feel? How do you feel about that now? How do you explain your past successes? Do you have any desire to achieve present and future successes? What immediate goals would you like to achieve? Start out modest by working harder today than you did yesterday. Ask yourself at the end of every workout, "Did I really work harder than yesterday?" What will your answer be? You know there is only one answer if you want to improve. Yes . . . yes . . . yes. Make a commitment right now to give the maximum effort to each workout. This is the first day of the rest of your life. Do it! You have enough control and willpower to deal with the fatigue and your inner talker. Recognize the cues, initiate your breathing strategy, visualize your past successes, segment the distances you've committed to run, and let yourself be the success you want to be and certainly deserve. Hey, you can do it! It's no problem, just commit yourself to your own personal excellence. You have the positive attitude inside you, just let it out. When you do it will engulf you. Be the success you want to be. Don't use others to gauge your own success. You are the only person in this world that you are in charge of. Success is compared against the degree of commitment you're willing to commit. Work on developing your powerful strategies. They will be effective, and they will improve as you spend some time learning and

JM (continued)

using them. As the music plays, tune into your feelings of being in control of the situation. Perform your work-out and feel the symptoms of fatigue. Test yourself. Trust yourself. Reinforce yourself for having coped with fatigue and for being in control. You feel good when you're in charge.

(Selection from Jonathan Livingston Seagull, 3:38 min.)

Appendix E

(continued)

CM

Picture yourself during a workout. As you perform, keep uppermost in your mind that the fatigue you initially feel is nearly entirely psychological, and that this "mind fatigue" is transferred into physical symptoms. This fatigue you can deal with because you have control over your thinking, and you have a breathing strategy to initiate your feelings of success from your previous experiences. You can cope with the ensuing feelings of tiredness. As you continue your workout, your shoulders tend to hike up and pull you in a backward direction. Do you recognize this feeling? Can you recall this feeling now? Use this feeling as a cue for you to begin to exert personal control over the situation. Do this by focusing on your breathing. Inhale . . . hold it . . . exhale. Inhale . . . hold it . . . exhale. Begin a breathing and counting exercise. Inhale . . . say "1" . . . exhale. Inhale . . . say "2" . . . exhale. Inhale . . . say "3" . . . exhale. Continue this pattern until the count of 20. Now that you are in control, notice that your shoulders are relaxed and that you do not feel as constrained as before. Your stride is now smoother and longer because your upper body no longer hampers your leg action. This relaxation strategy will allow you to push fatigue into the background. The fatigue doesn't

CM (continued)

control you; you control it. There's a real sense of satisfaction knowing you're in charge, isn't there? Be careful not to reduce your control by quitting. You know what a "let down" feeling that gives you. Realize that this feeling only occurs when you reflect back on your quitting. Think about how bad you feel later, and realize that the only remedy is to keep going. Commit yourself to excellence in every workout and give your maximum intensity to the performance. Don't let your inner talker scare you with such comments as, "You better look good," or "What if someone saw you going this slow?" Recognize that your inner talker is trying to take some of the control out of your hands. Don't allow it! Use the comments to initiate your breathing strategy. When you hear the comments, focus on your breathing. Inhale . . . "1" . . . exhale. Continue until you feel back in charge. Immediately follow with a recall of a success experience, especially one in which you exceeded your expectations. Cloud yourself in the success feeling. This would be a good strategy to do daily, before you run and certainly as you're running. Your past successes reinforce that you can achieve greater heights if you'll just unleash the power and control you already possess. Be the runner you want to be. Go for the gold! Realize also that the only person you are in charge of is yourself, and that you never need to feel alone because you have so many good experiences to relive. They will

CM (continued)

make the time go by easier. Your inner talker is trying desperately to convince you to cut your weekend practices down because you don't like to run alone. Don't listen! Run, and fill the time with your favorite songs, decorate your house, plan your wedding, or do whatever is pleasing to you. When you commit yourself fully to the task of running you will feel truly in control. How hard are you prepared to work? Success is really compared against the degree of commitment you're willing to set. Work on your strategies. Develop your positive affirmations to the fullest. Your strategies will be effective, and they will improve as you spend some time learning and using them. As the music plays, tune into your feelings of being in control of the situation. Perform your workout and feel the symptoms of fatigue. Test yourself. Trust yourself. Reinforce yourself for having coped with fatigue and your inner talker. You feel good when you're in charge.

(Selection from Jonathon Livingston Seagull, 3:38 min.)

Appendix E
(continued)

MR

Picture yourself during a workout. As you perform, keep uppermost in your mind that the fatigue you initially feel is nearly entirely psychological, and that this "mind fatigue" is transferred into physical symptoms. This fatigue you can deal with because you have control over your thinking, and you have a breathing strategy to initiate your feelings of success from your previous experiences. You can cope with ensuing feelings of tiredness. As you continue your workout, your thighs feel very heavy and this is followed by an awkward feeling in your arms. Together, these feelings produce constricted movements and your stride loses its length and rhythm. Do you recognize these feelings and happenings? Can you recall these feelings now? Pay attention to the specific feelings. Can you locate them exactly? Use these feelings as cues for you to begin to exert personal control over the situation. Do this by focusing on your breathing. Inhale . . . say "1" . . . exhale. Inhale . . . say "2" . . . exhale. Begin a breathing and counting exercise. Inhale . . . say "1" . . . exhale. Inhale . . . say "2" . . . exhale. Inhale . . . say "3" . . . exhale. Continue this pattern until the count of 20. Now that you are in control, notice that the heaviness feeling has nearly disappeared. Your stride is now smoother and longer, and your

arms don't feel awkward. This relaxation strategy will allow you to push fatigue into the background. Instead of feeling that you are a pretty "wimpy" runner when it comes to pain, now you have a strategy that puts you in charge. The fatigue and pain don't control you; you control them. There is a real sense of satisfaction knowing **you're in charge, isn't there? Beware your negative** inner talker who places all kinds of extra burdens on you to increase the difficulty of the task. The comments dealing with "you can't do this, and you can't do that" serve no useful purpose. You must recognize that your inner talker is trying to get you to play a disastrous game. It's called, "Who's in charge?". Choose not to pay attention to the content of the dialogue, but recognize it so that you can cope with it. **Do this by focusing on your breathing. Inhale . . . say "1" . . . exhale** Continue until you feel in charge. Reduce the difficulty of your training task by setting short distances as your goal (for example a tree, a post, or some landmark). Stay focused only on this immediate goal, don't look beyond it. Once you bypass your first goal, choose another one and continue to focus on that one. This strategy really brings meaning to a recent song: "Another one bites the dust . . . and another one, and another one . . . another one bites the dust." When the going gets

MR (continued)

tough, recall some success experiences from your past. Think back to a situation wherein you surpassed your expectations. How did you feel? How do you feel about that now? How do you explain your past successes? Do you have any desire to achieve present and future successes? You really have no idea how good you are until you make a commitment to excellence, a commitment to maximize your intensity in your workouts. That's where performance success is going to come from. You have unlimited resources and control--all you have to do is unleash them. When you do they will engulf you. Be the success you want to be. Don't use others to gauge your own success. You are the only person in this world that you are in charge of. There are other runners that perhaps have more ability than you and it may be that they will pass you. Is this such a disaster? The answer is "yes" if you are not performing at your maximum intensity. If that's the case, use the passing as a cue to relax and stride out. You aren't chasing the person ahead of you, you're simply performing at the level of your capabilities and, as importantly, at the level of your personal commitment. What is the level of this commitment? How hard are you prepared to work? Success is really compared against the degree of commitment you're willing to set. Work on your strategies, develop your powerful positive affirmation to the fullest. Your strategies

MR (continued)

will be effective, and they will improve as you spend some time learning and using them. As the music plays, tune into your feelings of being in control of the situation. Perform your workout and feel the symptoms of fatigue. Test yourself. Trust yourself. Reinforce yourself for having coped with fatigue and your negative inner talker. You feel good when you're in charge.

(Selection from Jonathan Livingston Seagull, 3:38 min.)

Appendix E

(continued)

ES

Picture yourself during a workout. As you perform, keep uppermost in your mind that the fatigue you initially feel is nearly entirely psychological, and that this "mind fatigue" is transferred into physical symptoms. This fatigue you can deal with because you have control over your thinking, and you have a breathing strategy to initiate your feelings of success from your previous experiences. You can cope with the ensuing feelings of tiredness. As you continue your workout, you notice that you begin to lose your breath. It may be that you are shallow breathing. Your arms and legs feel very tight and this combination restricts your stride. These are the cues for you to begin to exert personal control over the situation. Focus on your breathing. Inhale . . . hold it . . . exhale. Inhale . . . hold it . . . exhale. Begin a breathing and counting strategy. Inhale . . . say "1" . . . Exhale . . . Inhale. . . . say "2" . . . exhale. Inhale . . . "3" . . . exhale. Continue this pattern until the count of 20. This strategy will allow you to continue and to push the fatigue into the background. Now that you are back in control, focus on how much longer and smoother your stride is. The heaviness has left your arms because your stride has lengthened out. Make your distance task less difficult by setting short distances as your goal (for example a tree, a post,

ES (continued)

or some landmark). Stay focused only on this immediate goal, don't look beyond it. Once you bypass your first goal, choose another one and continue to focus on that one. This strategy of your's really brings meaning to a recent song: "Another one bites the dust . . . and another one, and another one . . . another one bites the dust." You have all the control and willpower you need to deal with the fatigue feelings and to keep up to others you are training with. All you have to do to unleash your willpower is to initiate your breathing strategy and follow with a focusing on your success experience. Don't limit yourself. Don't talk yourself out of your performance. It's normal to have thoughts of stopping when the going gets tough, everybody has them. Your negative self-talker will try to get you to entertain all kinds of thoughts to distract you from achieving your goals. Always finish what you start. Commit yourself to excellence in every performance. Sing your favorite upbeat song. Choose one with a rhythm that will challenge you to keep up with it. Experiment with a number of songs until you find one that really works for you. Fatigue is part of the track experience, you already are well aware of that. Recognize fatigue for what it is--a natural outcome of effort expended--but use the feeling as a cue to cope. Don't worry about fatigue. When you train hard, be proud of yourself and realize that your hard work gives

ES (continued)

you an advantage over your opponents. Every day you train commit yourself to completing your workout at your maximum intensity. When your inner talker asks, "Is one day that important?" answer with increased effort to display that you are in charge of the situation. Don't turn any control over to the inner talker. That's just a game that's being played. Your strategies will be effective, and they will improve as you spend some time learning and using them. As the music plays, tune into your feelings of being in control of the situation. Perform your workout and feel the symptoms of fatigue. Test yourself. Trust yourself. Reinforce yourself for having coped with fatigue and being in control. You feel good when you're in charge.

(Selection from Jonathan Livingston Seagull, 3:38 min.)

Appendix E
(continued)

MS

Picture yourself during a workout. As you perform, keep uppermost in your mind that the fatigue you initially feel is nearly entirely psychological, and this "mind fatigue" is transferred into physical symptoms. This fatigue you can deal with because you have control over your thinking, and you have a breathing strategy to initiate your feelings of success from your previous experiences. You can cope with the ensuing feelings of tiredness. As you continue your workout, pay attention to where you begin to feel the fatigue first. In addition to your chin being somewhat painful, do you feel fatigue in the ankles? calves? thighs? arms? shoulders? Locate the fatigue. Learn to recognize this feeling. This feeling will be the cue for you to begin to exert personal control over the situation. Do this by focusing on your breathing. Inhale . . . hold it . . . exhale. Inhale . . . hold it . . . exhale. **Begin a breathing and counting strategy for relaxation purposes. Inhale . . . say** "1" . . . exhale. Inhale . . . say "2" . . . exhale. Inhale . . . say "3" . . . exhale. Continue this pattern until the count of 20. This strategy will allow you to relax whenever your need it. The feeling of fatigue will tell you that it is time to cope. As your workout continues and it becomes more difficult to continue, day

MS (continued)
dreaming is a very good strategy to push fatigue back from immediate consciousness. Think of situations that you really enjoy. Times when you were really successful. Who was with you? What were you wearing? How did you feel in the success experience? Don't let your outside worries distract you from your maximum involvement in the track experience. Certainly your feelings about non-track matters are important, but you must commit yourself to excellence to derive maximum satisfaction and success from all your efforts. Even on the long runs, it is important that you perform with maximum intensity if you are to get the important overtraining effects. Don't minimize the importance of the distance training. You have all the control and willpower you need to deal with your fatigue feelings and to complete every workout. When the going gets tough, just relax. Do that by focusing on your breathing. Return to the breathing and counting exercise. Inhale . . . "1" . . . exhale. Continue to the count of 20 or until you can initiate your day dreaming success strategies. Your strategies will be effective, and they will improve as you spend time learning and using them. As the music plays, tune into your feelings of being in control of the situation. Perform your workout and feel the symptoms of fatigue. Cope with them. Use your strategies. Test yourself. Trust yourself. Reinforce yourself for having coped with

MS (continued)

fatigue and for being in control. You feel good when you're in charge.

(Selection from Jonathan Livingston Seagull, 3:38 min.)

Appendix E

(continued)

ST

Picture yourself during a workout. As you perform, keep uppermost in you mind that the fatigue you initially feel is nearly entirely psychological, and that this "mind fatigue" is transferred into physical symptoms. This fatigue you can deal with because you have control over your thinking, and you have a breathing strategy to initiate your feelings of success from your previous experiences. You can cope with the ensuing feelings of tiredness. As you continue the workout, you begin to notice the feelings in your lower legs, ankles, and feet. Your ankles stiffen and you feel like you're losing the smooth heel-to-toe rolls that typify your racing style. This is your cue to exert your personal control. Focus on your breathing. Inhale . . . hold it . . . exhale. Inhale . . . hold it . . . exhale. Begin a breathing and counting exercise. Inhale . . . say "1" . . . exhale. Inhale . . . say "2" . . . exhale. Inhale . . . say "3" . . . exhale. Continue this pattern until the count of 20. Now that you are back in control, focus on how much stronger you will be because you pushed for glory. Exhaustion will be rewarded by upcoming positive outcomes. Picture what the newspaper will say about you. In large, bold print the headline declares SUE WINS AGAIN. The following feature article on you quotes you saying how

ST (continued)

you make a total commitment even for every practice in order to maximize your performance. As long as you work your hardest every day, the end result will take care of itself. You will be as successful as your ability will allow. Don't force success, work hard, prepare for it, and let it happen. The newspaper article also contains a column on how you deal with your inner talker. As your workout gets tougher and you begin to feel negative sensations in the shoulders and chest, along with stiffness in the ankles, your inner talker begins to play games with you. The purpose is to break your concentration or snap your mind. Your inner talker gets emotional, screams, and yells out such names as wimp, loser, and total loser. It even gets humorous what lengths your inner talker will go to get you to stop. What a joke! Smile your inner talker away. But, remember your negative inner talker is your worst enemy; you, on the other hand are your greatest strength. You are the person in charge. Don't try to block out the negative feelings and become frustrated, challenge the inner talker by working harder. Use the inner talk as a cue to cope. Recall your comments in the newspaper dealing with your commitment to excellence. Return to the breathing and counting exercise. Inhale . . . say "1" . . . exhale. Continue to the count of 20 or until you can begin to initiate your strategies. Your strategies will be effective, and they will improve as you spend some

ST (continued)

time learning and using them. As the music plays, tune into your feelings of being in control of the situation. Perform your workout and feel the symptoms of fatigue. Cope with them. Use your strategies. Test yourself. Trust yourself. Reinforce yourself for having coped with fatigue and being in control. You feel good when you're in charge.

(Selection from Jonathan Livingston Seagull, 3:38 min.)

Appendix E

(continued)

CV

Picture yourself during a workout. As you perform, keep uppermost in your mind that the fatigue you initially feel is nearly entirely psychological, and that this "mind fatigue" is transferred into physical symptoms. This fatigue you can deal with because you have control over your thinking, and you have a breathing strategy to initiate your feelings of success from your previous experiences. You can cope with the ensuing feelings of tiredness. As you continue your workout, you begin to notice the feelings of tiredness. As you continue your workout, you begin to notice the feelings in your knees, not actually pain but certainly not pleasant sensations. This is your cue to exert your personal control. Focus on your breathing. Inhale . . . hold it . . . exhale. Inhale . . . hold it . . . exhale. Begin a breathing and counting exercise. Inhale . . . say "1" . . . exhale. Inhale . . . say "2" . . . exhale. Inhale . . . say "3" . . . exhale. Continue this pattern until the count of 20. Now that you are back in control, set up short distances as your goal (for example a tree, a post, or some landmark). Stay focused only on this immediate goal, don't look beyond it. Once you bypass your first goal, choose another one and continue to focus on that one. This strategy of your's really brings life to a recent song: "Another one bites

CV (continued)

the dust . . . and another one, and another one . . . another one bites the dust." As the workout gets tougher, your inner talker likes to play a game with you called "Who's in charge here?" It asks questions like "What's the use?" "Why kill yourself?" and offers to thank you if you slowed down and quit. However, you are the person in charge, Boss Voss. Boss Voss doesn't ignore the inner talk, but she recognizes it exactly for what it is--a game that's being played to reduce your effectiveness. Boss Voss is a strong, powerful force who likes to accept the challenge of overcoming the adversity of fatigue by working harder. Boss Voss has made a commitment to personal excellence and she won't compromise. The sensations in the knees and the appearance of the negative inner talk are cues that the game is on. Return to the breathing and counting exercise. Inhale . . . say "1" . . . exhale. Continue to the count of 20 or until you can begin to initiate your strategies. Your strategies will be effective, and they will improve as you spend some time learning and using them. As the music plays, tune into your feelings of being in control of the situation. Perform your workout and feel the symptoms of fatigue. Cope with them. Use your strategies. Test yourself. Trust yourself. Reinforce yourself for having coped with fatigue and being in control. You feel good when you're in charge.

(Selection from Jonathan Livingston Seagull, 3:38 min.)

Appendix F

PART I RELAXATION EXERCISE

Lie on your bed, or sit in a comfortable chair. Close your eyes. I want you to concentrate on your breathing, in order to become relaxed. Take a deep breath . . . hold it . . . exhale. Inhale . . . hold . . . exhale. With each breath, hold the inhalation and exhale fully. Each time you inhale, feel that you are pulling all your worries, cares, and tensions that you feel into your lungs and exhale them with each breath. Feel more and more relaxed with each breath. With each exhalation more and more of your cares and tensions disappear. Continue this breathing pattern. Take a deep breath . . . hold it . . . exhale. Inhale . . . hold it . . . exhale. Take this time to become more and more relaxed.

(Pause 30 sec.)

Appendix G

PART II STANDARD SUCCESS EXPERIENCE

I would like you now to recall a track performance in which you were extremely successful--a time when you really maximised your efforts and talents. The outcome of this situation really pleased you. You worked hard and you were rewarded. Make this success experience clear and alive. Not only see the success but project yourself into the situation and feel the success. What do you feel? Whom do you see? What do you hear? What do you taste? Doesn't the success feel good? Sink back into that feeling and milk it for all it's worth. Recall how confident you felt and how much in control of the situation you were. Maybe you didn't realize it, but that's the real you waiting to come out. Let the real you, the confident you out. That's the real you! Anytime during your practice or during your thinking about track performance that you begin to feel that you are losing control, concentrate on your breathing (inhale . . . hold it . . . exhale) and return to your success experience and lose yourself in it for a short period of time. Do this anytime you feel fatigued or worried about any aspect of your performance. Relax, see and feel your past success, and you will find the real you. As you listen to the music, let your feelings flow with this success experience you recall. Focus on the sensual experience don't miss a thing. This is an important part of your life to relive; be thankful it occurred but realize above all

Appendix G (continued)

else that you made it happen. You produced the success. Congratulations. This is the you that was, and the you that can be whenever you exercise your personal control. Remember you control fatigue and effort, fatigue never controls you. Tune into your feelings as you listen to the music.

(Selection from Jonathon Livingston Seagull, 3:38 min.)

Appendix H

PART IV POST-DIALOGUE EXPERIENCE

Continue to keep your eyes closed. Concentrate on your breathing. Inhale . . . hold it . . . exhale. Breathe out any cares that you might have. Continue the breathing pattern. Feel more relaxed with each breath. As each day goes by, you learn more and more about yourself and your personal control over your effort and fatigue becomes stronger and stronger. Fatigue is something you are learning to deal with. Your performance is becoming more effortless because you are in charge, not the fatigue. You will be able to perform right through the fatigue. Knowing that makes you feel very successful, and so it should because you are the success you want to be. Keep that always uppermost in you mind, no matter what you hear from your inner talker. Remember, you are the real you; your inner talker is just playing games to test you. Exercise your intentional, personal control and commit yourself to your goals. You are in charge! Perform as if you mean it. Be more successful tomorrow than you were today and yesterday. When you hear the tone, open your eyes, and rewind the tape for the next night's listening.

(Tone)

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